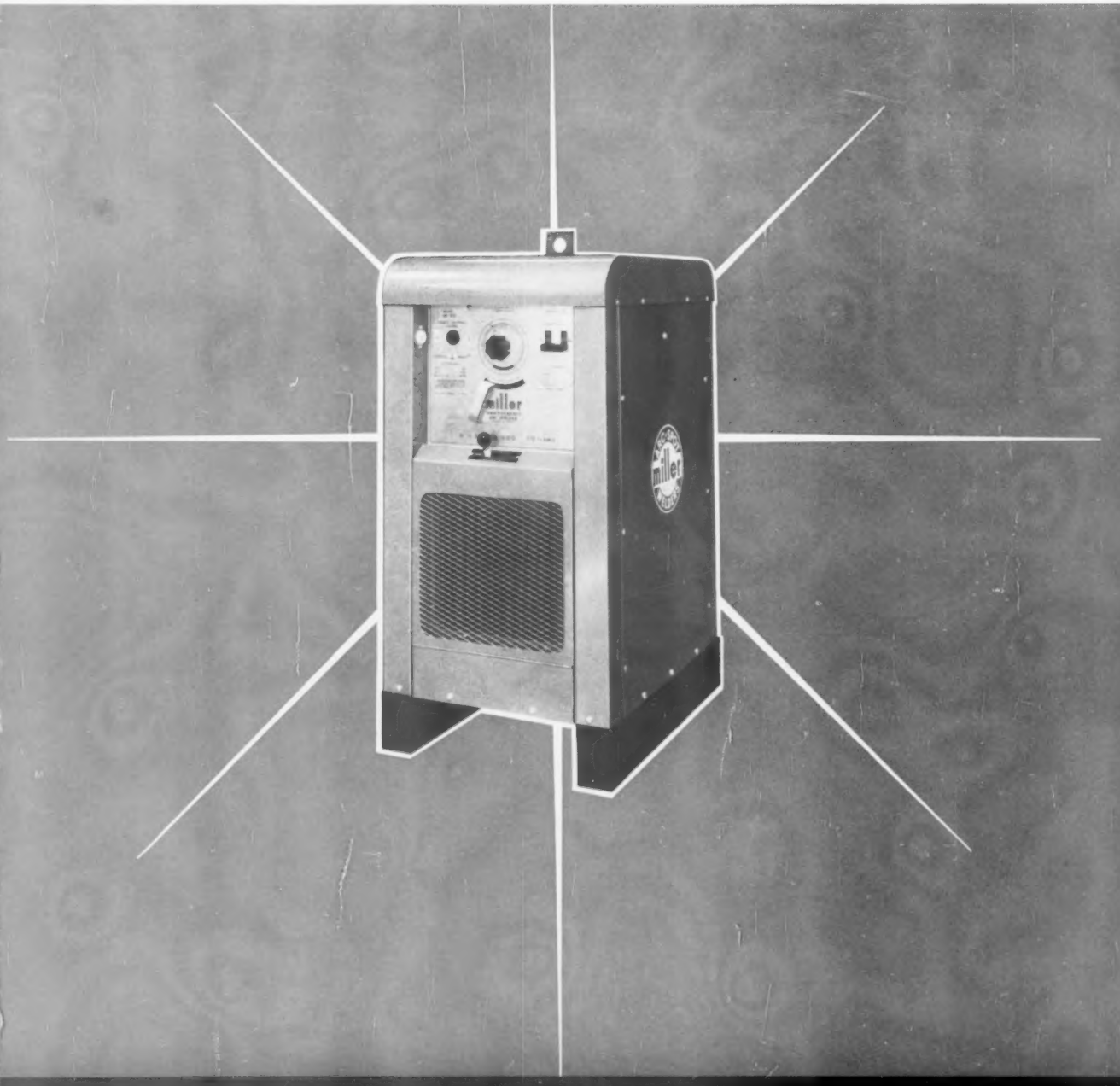
Welding Engineer

PRICE 50 CENTS

JANUARY, 1957



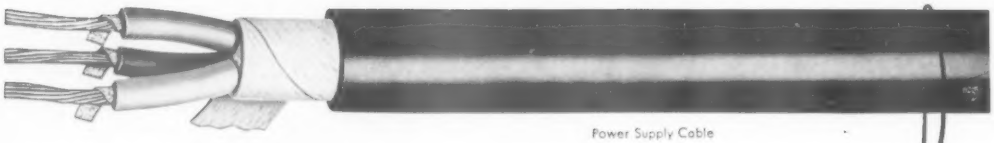
miller
ELECTRIC MANUFACTURING CO., INC.
APPLETON • WISCONSIN

Introduction of the MILLER SR series established new industry standards for selenium rectifier type dc arc welders. This line is available in single, duplex, lowboy and special application models in sizes from 200 to 1200 amperes with 60% duty cycle ratings.

". . . if it's Miller you know it's the finest . . ."

Power Supply Cord

If it's worth engineers' time...



Power Supply Cable

...it's worth engineered cable

Belden

WIREMAKER FOR INDUSTRY
SINCE 1902
CHICAGO

5-W

Magnet Wire • Lead and Fixture Wire • Power Supply Cords, Cord Sets and Portable Cord • Aircraft Wires
Welding Cable • Electrical Household Cords • Electronic Wires • Automotive Wire and Cable

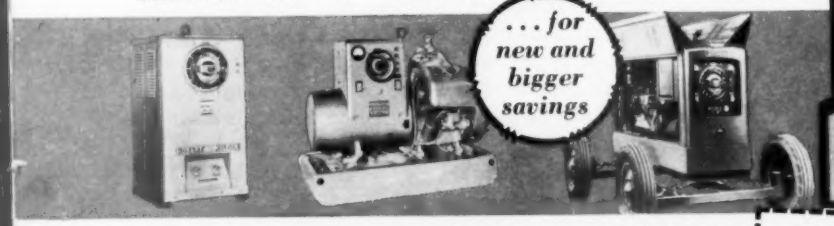
here's the new HOBART rectifier welder designed to give you

extra cost-cutting advantages

Low operating cost is only one of the many new features you get in the new Hobart DC Rectifier. Hobart's new design, "diverter path," brings smoother welding with an exceptionally easy striking arc. New and simplified controls give the operator infinite welding settings for any number of machine adjustments for various types of electrodes and positions. Remote control, fast acting polarity switch and other convenience features all at no extra cost. You'll be amazed at the wide welding range and performance of Hobart's DC Rectifier Arc Welder. It's the biggest welder value on the market today. Phone or write now for complete specifications and prices to HOBART BROTHERS COMPANY, BOX U-17, TROY, OHIO, 'Phone FEderal 2-1223.

The Most Complete Line of Arc Welders on the Market.

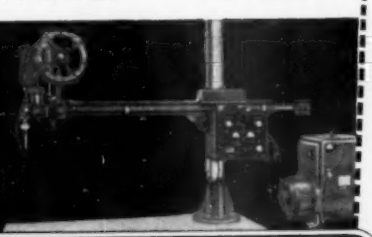
Electric Motor Drive — AC/DC Welder — "Husky Boy" Air Cooled



AC Transformers — AC Power or AC Welder — Gas Engine Drive

automatic welding

With Hobart's New Simplified Controls, it's easy for any metal working shop to take advantage of automatic and semi-automatic welding. No more elaborate or complicated installations. Check coupon for more details.



HOBART TROY OHIO **WELDERS**

. . . and ELECTRODES for every purpose

Have you tried the NEW and faster Hobart iron powder electrodes? Keep pace with faster production and lower cost welding. Hobart's "Rocket 24," hi-speed iron powder electrodes are especially designed for using the "drag" technique. Deposition rate is much higher than conventional type electrodes. Beads are smooth. Slag is practically self removing. Get more inches of weld per electrode. For proof—try a few "Rocket 24" electrodes on your own work.

HOBART BROTHERS COMPANY
BOX U-17, TROY, OHIO

Without obligation, send complete information on:

_____ *ampere capacity*

- ☐ *DC Rectifier*
- ☐ *Electric Motor Drive*
- ☐ *AC-DC Welder*
- ☐ *"Husky Boy" Air Cooled*
- ☐ *AC Transformer*
- ☐ *AC Power/AC Welder*
- ☐ *Gas Engine Drive*
- ☐ *Automatic Arc Welding*
- ☐ *Semi-automatic Welding*
- ☐ *Iron Powder Electrodes*

Name _____

Address _____

City _____ *State* _____

Hobart *"one of the world's largest builders of arc welding equipment"*

CESCO RIGHT...before your Eyes!

Welders Cup-type Goggles

CESCO
Hat 'n' Shield

IDEAL
Protection Equipment
to meet every welding requirement

CESCO **No.401-2** is a favorite all-purpose helmet. It features the No. 2 lift-front lens holder with shock-absorbing action. Its use permits easy layout and inspection of work. It has every safety and comfort feature of a good welding helmet. The one-piece seamless shell is drawn from hard vulcanized fiber. The chin rest is adjustable as is the form-fitting headgear.

Speed-Shift
Goggle

These new CESCO **Welders Cover Goggles** have been completely redesigned for easy fitting over the larger personal glasses. The increased size gives ample clearance without snagging. The goggles rest entirely outside the eye sockets. They give more comfort with better seal against light flashes. Cups are light, sturdy plastic. Ventilation ports allow circulation without entrance of light.

Fiber Glass
Welding Helmet

Write for complete Catalog and name of your nearest* CESCO *distributor

CHICAGO EYE SHIELD COMPANY • **2330 Warren Boulevard, Chicago 12, Illinois**

OFFICES IN: Atlanta, Baton Rouge, Birmingham, Boston, Buffalo, Cincinnati, Cleveland, Columbus, Dallas, Denver, Detroit, Houston, Kansas City, Knoxville, Little Rock, Los Angeles, Louisville, Mexico City, D.F., Milwaukee, Montreal, Orange, Peoria, Philadelphia, Pittsburgh, Salt Lake City, San Mateo, Spokane, St. Louis, St. Paul, Toledo, Tulsa

Helmet
for
cramped
quarters

Fiber Spectacle

CESCO FOR SAFETY

Welding Engineer

JANUARY, 1957
VOL. 42—No. 1

THE MAGAZINE OF JOINING
AND SEVERING OF MATERIALS

America's pioneer publication which, combined with The Acetylene Journal, has been devoted to the interest of the welding and allied industries since 1898

© 1957 by
WELDING ENGINEER
PUBLICATIONS, INC.
12 East Grand Avenue
Chicago 11, Illinois
Telephone: DElaware 7-0339

TED B. JEFFERSON
Editor and Publisher

FELIX T. TANCULA
Executive Editor

JACK FAIRLIE
Associate Editor
AUDREY L. MADSEN
ROBERT KULAR
Assistant Editors
B. M. BRITE
Editorial Assistant

PATRICE L. SIMPSON, *Production*

JIM BREWSTER, *Circulation*

WARREN WARE
Western District Manager
12 E. Grand Ave., Chicago 11, Ill.
Telephone: DElaware 7-0339

HERMAN PHELPS
Eastern District Manager
P. O. Box 128, White Plains, N. Y.
Telephone: WHite Plains 9-3876

MEMBER
American Welding Society
International Acetylene Association
Compressed Gas Association
National Welding Supply Association
Audit Bureau of Circulations

Single copies 50 cents. Subscription rates: United States and possessions $3 per year; $4 for two years; $5 for three years. Canada $5 per year; $8 for two years; $10 for three years. All other countries $15 per year; $25 for two years; $30 for three years. Position and company affiliation must be indicated on subscription form. Allow one month for change of address.

Published monthly, with an additional directory number in June, by Welding Engineer Publications, Inc.

Entered as second class matter Aug. 23, 1948, at the Post Office at Chicago, Ill., under Act of March 3, 1879. Printed in U. S. A.

WELDING ENGINEER is indexed regularly by Engineering Index, Inc.

OPERATION

Resistance Welding: The past and present ... 20
Jack Fairlie
TV spots build-up on resistance electrodes ... 24
Learning to work with weldability ... 26
Bela M. Ronay
"How to do it" with an oxyacetylene torch ... 32
T. B. Jefferson
Semiautomatic hardfacing comes of age ... 45
Optical marking speeds plate cutting ... 67

CONSTRUCTION

All-welded bridges dot Kansas Turnpike ... 72
Stadium ribs stand without a spine ... 74

FABRICATION

Power crane booms improved through welding ... 30
F. T. Tancula
Kelvinator gets better welds with CO_2 Mig ... 42
The right electrode spells e-c-o-n-o-m-y ... 70
Metallizing solves heat and rust problems ... 77

INSPECTION

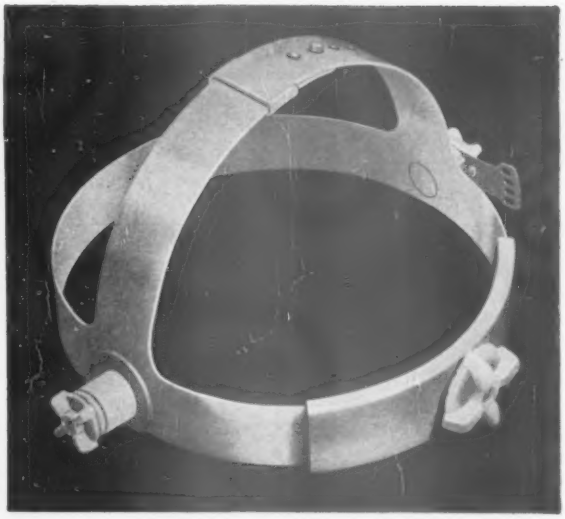
Hell and high water couldn't lick these welds ... 29

SPECIAL REPORTS

Mig and Tig take 64% bite in private helium supply ... 38
Wide market seen for liquid cylinders ... 46
F. T. Tancula
50 years a weldor ... 52
Chicago Welding Sales holds an open house ... 60

DEPARTMENTS

News ... 5
Your WeldWorld at press time ... 9
Letters to the editor ... 10
30 years ago ... 11
Between Passes ... 13
Editorial: *New year . . . new leaf?* ... 17
Data Sheet No. 196: *Trade names of electrodes and comparable AWS—ASTM designations* ... 57
The welding clinic: *Properties of acetylene* ... 59
On the job ... 62
New Products ... 78
People ... 101
Free literature ... 104
Literature offered in ads ... 104
The Welding Shopper ... 105
Advertisers in this issue ... 106
Welding Info-Aids ... 107



NEW All Nylon Adjust-O-Lok Headgear

Nylon, lightweight and non-conductive, lends its superior, long wearing strength to every part of this completely redesigned arc welding helmet headgear.

The large, easy to handle winged knob and the gear, both of Nylon, engage a Nylon headband to give fine adjustment to head size while helmet is worn. Headband is molded in one piece with a cross strap, *now also adjustable*, over the top of the head.

The headband adjustment is entirely enclosed in a Geon sleeve, smooth fitting against the head.

Jackson Leads Way with Better Helmets

NEW Nylon Friction Pivots

All pivot parts are Nylon, except the entirely enclosed spring, so no current can pass through to the wearer's head. New winged nuts provide easier hand adjustment from the outside without taking the helmet off. A stop, located inside of the helmet shell, is attached to one of the Nylon pivots to halt the helmet's down movement, and is quickly adjusted to the exact position you may require.

NEW Straight Front Helmets with Fiber Glass Shells

To those who prefer helmets of this popular shape, JACKSON now offers a line of helmets of the same quality as its curved and narrow shell styles, with the same new features. Made of fiber glass, strong, smooth, easy to clean, resistant to heat and moisture, *they last.*

For the Best in Arc Welding Helmets Jackson Offers You 3 x 3 x 2 = 18 Models to Choose from

YOUR CHOICE OF:

3	**HELMET SHELLS...**	**CURVED SHELL**	**NARROW SHELL**	**STRAIGHT SHELL**
3	**LENS HOLDERS...**	**PLASTIC FIXED FRONT**	**METAL FIXED FRONT**	**PLASTIC LIFT FRONT**
2	**HEADGEARS...**	**THE NEW ALL-NYLON ADJUST-O-LOK — OR THE ECONOMY HEADGEAR No. 62**		

All Lens Holders and Headgears are Interchangeable

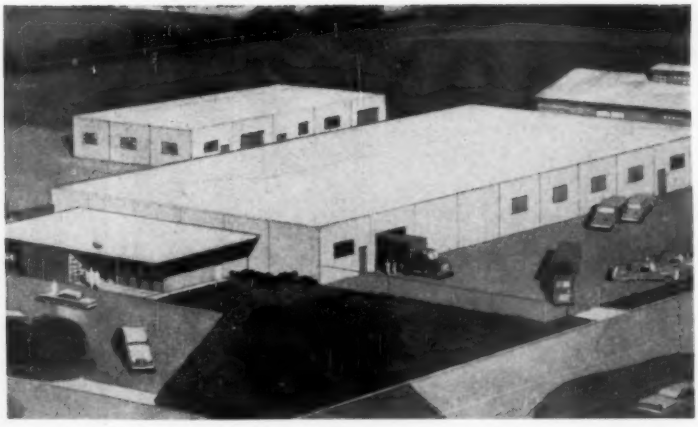
Made by the World's Largest Manufacturer of Arc Welding Electrode Holders, Ground Clamps and Cable Fittings, Sold World-Wide through Distributors and Dealers.

Jackson Products

AIR REDUCTION SALES CO., A DIVISION OF AIR REDUCTION CO., INC.

WARREN · MICHIGAN

WELDOR installs headed shear connectors with stud welding gun on Florida Turnpike. (See story below.)



NEW 40,000 sq ft, Norwalk, Calif., plant has air-conditioned, humidity-controlled facilities for manufacture of electrodes. (See story below.)

News

Stud welding on Florida turnpike

Use of welded studs as shear connectors has enabled contractors working on an 8-mile section of the Florida Turnpike, near Stuart, Fla., to reduce time required for erection of composite bridge decks.

Shear connector studs (¾ by 4-in.) from Nelson Stud Welding Div., Lorain, Ohio, were installed, five abreast at 12 in. intervals, along 50-ft beams spanning highways and canals in the 8-mile section of the Turnpike.

Bridge erection crews worked in teams, with carpenters first installing form work on one span, followed by stud weldor and his helper. Placement of concrete followed. One 50-ft span was completed each day.

It's now official, Airco buys Jackson

A long-rumored deal in the welding industry is no longer a rumor. It's a fact.

Air Reduction Sales Co., on Dec. 11, officially announced its acquisition of Jackson Products, Inc. Airco President J. H. Humberstone said that Jackson's present distribution channels will be maintained. He called the transaction a further step in Airco's program of diversification.

H. A. Jackson, founder of the firm that manufactures welding electrode holders, helmets, safety goggles and other types of arc-welding accessories and safety equipment, will continue with the organization in an advisory capacity. A. C. Gilbert, general manager, will continue in that same position.

Atlas expands its facilities

A new building addition adjacent its present headquarters will give Atlas Welding Accessories, Inc., 3,500 more square feet of space at its Ferndale, Mich., site. Ferndale is a Detroit suburb.

The new facility will enable Atlas to devote the entire area of its present building to production of its weld-cleaning tools. The new structure will house activities of the firm's allied accessory lines.

The addition, a separate building, will match the old in its brick and stone construction. Completion of the project is scheduled for spring of this year.

Air Products acquires Steele Gases

Air Products, Inc., Allentown, Pa., has acquired assets of Steele Gases, Inc., Chicago. Formed in 1946 with Charles W. Steele as president. Steele Gases will operate as a subsidiary of Air Products, with Mr. Steele continuing as president. In addition, he will be responsible for operations of Midwest Air Products, Inc., manufacturer of cylinder gas. Steele manufactures oxygen, nitrogen, acetylene and other gases.

Victor operates new modern plant

The new Norwalk, Calif., plant of Victor Equipment Co., Alloy Rod & Metal Division, contains 40,000 sq ft of up-to-date manufacturing facilities for hardfacing rod and other products.

A feature of the plant is the method of straight-line production in the manufacturing process. Coating facilities for manufacture of electrodes are air-conditioned and humidity controlled.

Alpha Metals opens Chicago division

Alpha Metals, Inc., Jersey City, N. J., has opened its new sales and manufacturing division in Chicago. Located at 2250 S. Lumber St., the new division known as Alpha-Loy Corp., will be directed by Harold Cohn. Alpha Metals is a manufacturer of flux, solder, and solder preforms.

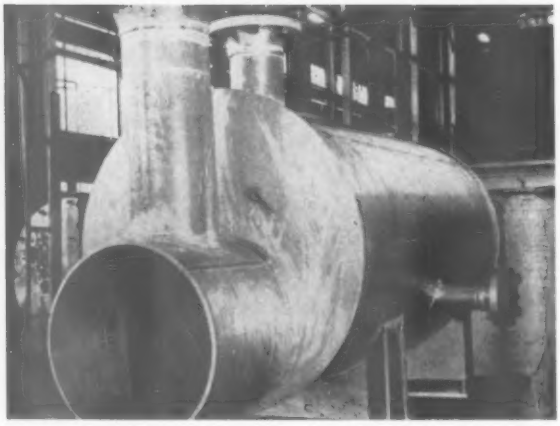
Cylinder Gases in new quarters

Cylinder Gases, Inc., has moved to new quarters at 2150 Hingston Ave., Montreal 28, Canada. The firm was formerly at 209 Colbourne St., in that city.

Beg your pardon . . .

In the November issue of WELDING ENGINEER, the article "Carbon-arc pad washing" stated that the process described was ordinary carbon-arc cutting. Actually, it was not. The carbon arc compressed air equipment and process detailed in that article are patented by Arcair Co., Lancaster, Ohio.

PART of gang of filler pass weldors are shown here at work on new coal pipeline which will carry coal, pulverized and suspended in water. (See story below.)



ALUMINUM heat exchanger is one of two manufactured for test program on propellant for rocket motors. (See story below.)

Welding a coal pipeline

Carrying coal to Newcastle was never like this. A coal pipeline, reported the first of its kind in the United States, will carry coal 108 miles from Hanna Coal Co. strip mines, south of Cadiz, Ohio, to the Cleveland Electric Illuminating Co.'s generating plant, east of Cleveland.

The 10-in. pipeline necessitated careful welding. Because of the erosive-corrosive material to be transported, heavy wall sections and high tensile steel were used. Five different pipe wall thicknesses were employed. Sixteen passes were used on the heavy wall pipe. All pipe used was 5LX-42 specification.

Bulk of the pipe had 30 deg bevel for welding on the end. Stringer beads were used for all passes except the cap pass which was a wide weave. In cold weather, pipe was welded without preheating by not allowing the pipe to cool between passes.

In order to prevent underbead cracking, it was necessary to have stringer bead weldors strip 3 in., top and bottom, before moving pipe to make the next line-up. The line used two men welding stringers, 3 on hot passes and 12 on filler passes.

The coal, pulverized and suspended in water, will be pumped at approximately 3½ mph. It is anticipated the line will be able to deliver 1,300,000 tons of coal per year.

—The Lincoln Electric Co.

Brazilian plant for Norton Co.

Norton Co., Worcester, Mass., has acquired controlling interest in Abrasivos Irmaos Meyer, S. A. of Sao Paulo, Brazil. The firm manufactures coated abrasives, grinding wheels, and abrasive grain. This represents the second Norton plant in South America—the first being Compania de Lijas y Esmeriles of Buenos Aires. The Argentine company manufactures coated abrasives.

The Brazilian plant will continue to be operated by Irwin, Frederico and Paul Meyer, who began the business in 1939. The plant consists of several units including mining rights at a bauxite mine, an electric furnace plant at Belo Horizonte, 300 miles north of Sao Paulo, a new grinding wheel plant at Guarulhas (a suburb of Sao Paulo) an office and several other buildings in Sao Paulo. A new coated abrasives plant is under construction at Guarulhas.

McDonald & Wilson in new building

McDonald & Wilson Sales Co. has moved to its new location at 3001 North Union Blvd., St. Louis, Mo. The new structure provides increased floor space and modern facilities for maintaining and storing new and rental equipment, accessories and supplies.

Midwest Conference in Chicago this month

The third annual Midwest Welding Conference will be held in Chicago, Jan. 30-31. The conference, sponsored by Armour Research Foundation of Illinois Institute of Technology and the American Welding Society, will be held in the chemistry building at IIT. Nuclear welding will be highlighted. *(For full program listing see* WELDING ENGINEER, *Dec., 1956, p. 6.)*

Welding heat exchanger for rocket motors

The all-aluminum heat exchanger, shown above, is one of two manufactured by The Griscom-Russell Co., Massillon, Ohio, for a development and test program on propellants for rocket motors. Liquid nitrogen will be vaporized in the shell side of shell-and-tube unit at — 320 F to cool liquid oxygen passing through tubes at — 285 F. Shell has ID of 32 in., tubes are ⅜ in. OD.

Tig and Mig welding were used in fabrication, welding on both sides wherever possible, with X-ray inspection of welds. An important factor was ductility of weld and weld areas equal to surounding metal in order to eliminate unequal temperature reaction. Thickness of aluminum welded ranged from ⅝—1 in.

Brake Shoe forms new railroad division

Effective the first of this month, four of the railroad divisions of American Brake Shoe Co., New York City, were combined in a newly created Railroad Products Division. Headquarters are in New York City.

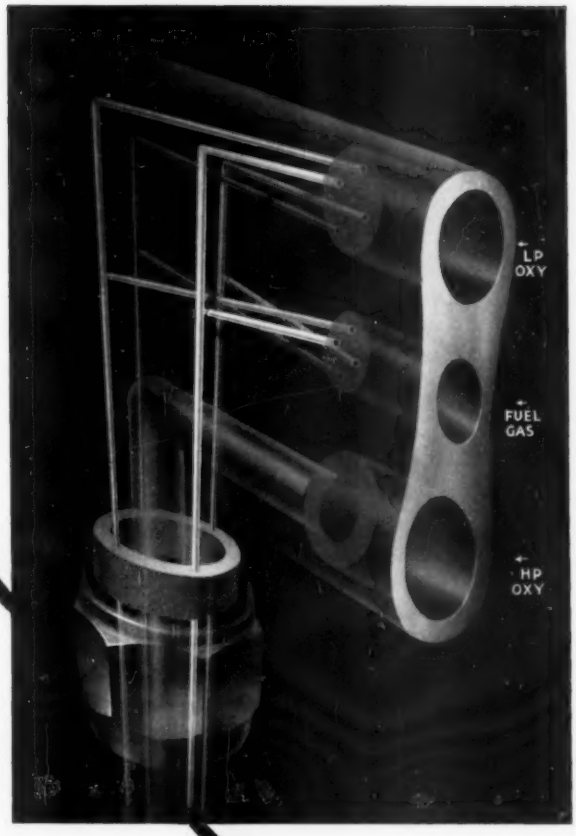
The new division combines the railroad product facilities of the present Brake Shoe & Castings Division, the National Bearing Division, the Ramapo Ajax Division and the Southern Wheel Division.

To discuss welding at maintenance show

A special panel will discuss maintenance welding at the 8th National Plant Maintenance & Engineering Conference in the Cleveland Public Auditorium, Jan. 28-30. The special

(Continued on page 88)

this finer cutting torch



multiple mixer in torch head... it offers greater safety and greater efficiency...

A cutting torch mixer may be located either within the torch handle, the torch tubes or the torch head. When located within the handle or the tube, the mixer is situated in close proximity to the operator's hands; no torch, however, need be held by its head.

And, besides, there is plenty of metal in that torch head to permit for an added advantage: Multiple Mixing. By breaking up the streams of the low pressure oxygen as well as the fuel gas into several separate channels, the port diameters are lessened, thus offering greater flash-back resistance.

This modern, patented, Multiple Mixing in the torch head is costlier to manufacture but it eliminates the need for a separate mixer, leaky seats and joints, and years of experience in shop and field have proved the outstanding excellence of this patented design feature.

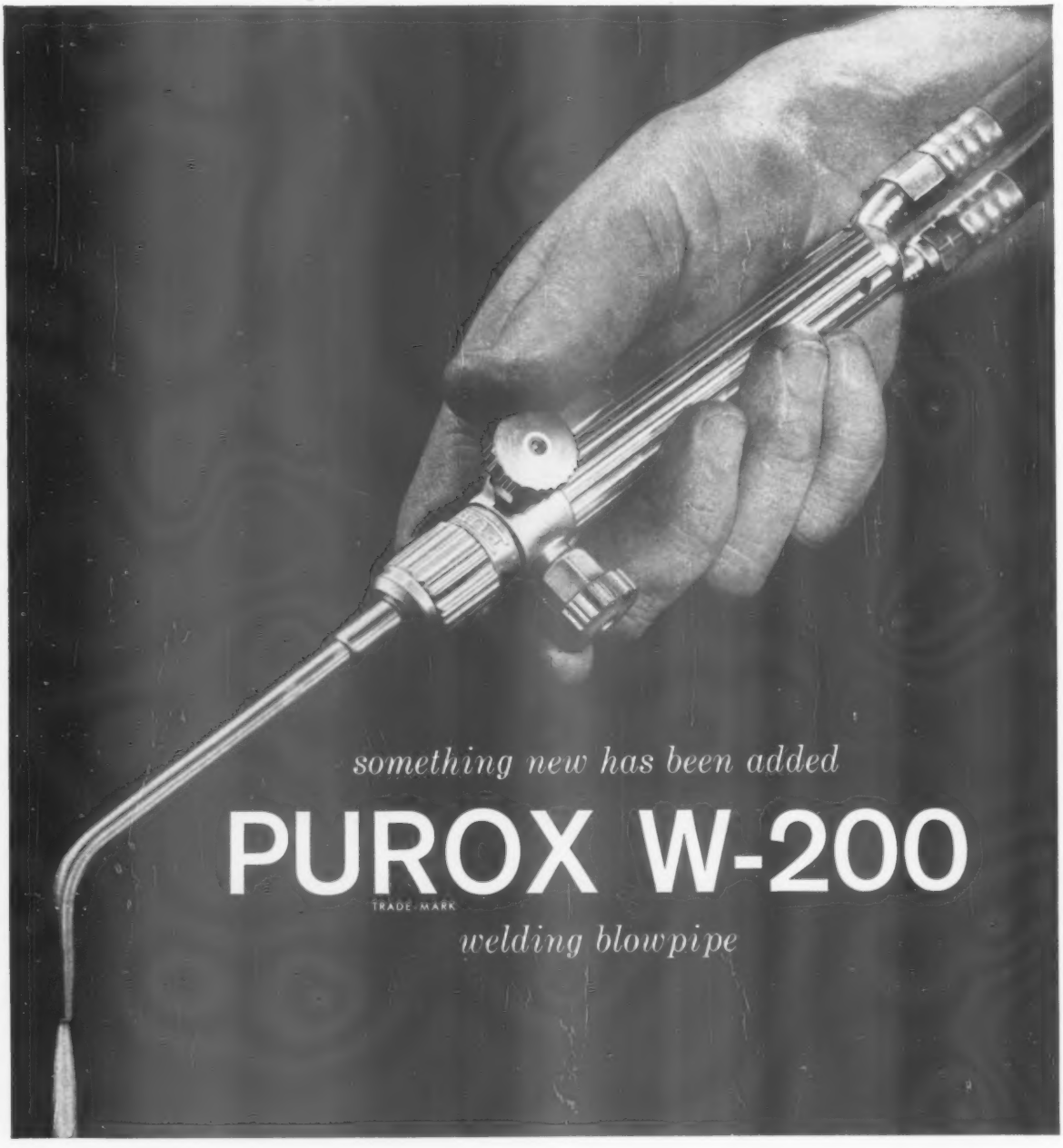
the mixer is located where it works best...and is safe.

is made by

National of ...california

NATIONAL welding equipment company... 218 fremont street san francisco 5 california

B34



A flick of the wrist slips this eight-ounce blowpipe into corners, around jigs and fixtures or into any other hard-to-reach spot with ease. Small and handy, the PUROX W-200 Welding Blowpipe combines operating comfort with results that bring all types of light welding work up to the most modern standards.

Everything about this blowpipe has been designed to eliminate excess motion and to help cut down operator fatigue. Forward valves, for example, permit instant flame adjustment with the same hand used to hold the blowpipe. Snap-in heads with "O" rings connect simply and seal gas-tight without a wrench. They can be rotated on the blowpipe handle without shutting off the flame. Heads in nine sizes give a complete welding range from 32 ga. to ⅜ in. thick.

See your LINDE Jobber

or write: LINDE AIR PRODUCTS COMPANY
Unit of Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

The terms "Linde" and "Purox" are registered trademarks of Union Carbide and Carbon Corporation.

JANUARY
1957

Your

Weld World

at press time

Last minute news of interest to those engaged in joining and severing materials.

. . Air Reduction Sales Co. undergoing reorganizational pangs. To streamline home office and field set-ups, Airco will now have three sales vice presidents in the field: Dale Spoor in Chicago, A. C. Brown, Jr., in the East, and Jack Lincoln in Houston. Airco's Equipment Mfg. Div. now becomes a department of Airco Sales. Air Reduction Pacific continues as separate division of Air Reduction, Inc. Another consolidation: all gas industry sales and manufacturing activities now under one veep.

. . Nickel increase of 9½ cents per pound was announced last month by International Nickel Co., Inc., and its parent company, Inco of Canada. This brings export price of electrolytic refined nickel to 74 cents per pound. Price includes 1¼ cents U. S. import duty paid by Inco. Reasons for hike: to meet higher costs and facilitate maximum production.

. . Speaking of nickel, the Defense Dept. feels that 200-series stainless can be ably substituted in about 90% of 300-series applications, saving many thousands of tons of nickel. (For performance data on the former, see Welding Engineer, June, 1956, p. 40.)

. . First quarter of this new year should keep pace set by last quarter of 1956, according to recent survey of purchasing agents. However, survey reflects lack of enthusiasm not shown in recent months.

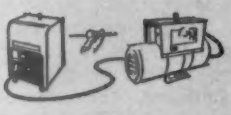
. . "Cautious optimism," however, is the description given forecasts for 1957 by the U. S. Chamber of Commerce. Spokesmen for 12 industries foresaw further price increases this year.... among them: steel, which might go up another $8.50 per ton.

. . Despite reports of rising copper supplies, prices are going up. Bronze welding rod is slightly higher than on Dec. 1. Copper producers say domestic demand is slowly improving, but falls far short of supply increase.

. . Steel scrap prices are on the way up. Some steel producers fear inventories have been reduced too quickly. Chief cause of shortage: high steel production . . . now running close to annual rate of 130,000,000 tons, compared with 1955 record of 117,000,000 tons.

. . Full story of advantages gained with welded stud shear connectors was not told last year. Complete test data will be announced shortly. Two firms have conducted extensive test programs to give welded studs new scope in highway constructions.

. . Price reductions of 6% to 8% for titanium mill products were announced last month by Titanium Metals Corp. of America. Du Pont Co. announced decrease of 25 cents per pound for top-grade titanium metal sponge.



. . Welding supply distributors also enjoy record prosperity. Third-quarter sales report from National Welding Supply Association shows sales running 20% ahead of same period in 1955. Sales for the nine-month period are 23% better than first nine months of 1955.

. . Price of pure silicon has dropped $30 per pound...from $320. Du Pont Co. announced the move last month. Semi-conductor grade silicon is used in rectifiers, transistors, diodes. Westinghouse, for instance, recently introduced a silicon-rectifier, d-c welding machine.

Tough! as they come

ATLAS TOMAHAWKS

Biggest sellers in the Atlas line—All-steel

"Rebit" replaceable bit Tomahawks with steel handles

"Dual Tools" Tomahawk and brush with and without replaceable bit

One of a big selection of Atlas wood handle Tomahawks

Atlas quality in low cost all-steel Tomahawks

Ask your welding supply dealer to show you the Atlas line

They ask us: *WHY* 30 *MODELS?*

We Answer:

—because weld cleaning jobs offer such a wide variety of problems—because welders have strong preferences for certain tool styles. Atlas has made a sincere effort to provide you with the tool you want regardless of your likes and dislikes, in ATLAS QUALITY!

ATLAS WELDING ACCESSORIES INC.

707 E. LEWISTON AVENUE, FERNDALE 20 (DETROIT) MICH.

Letters should be addressed to: The Editor, WELDING ENGINEER, 12 E. Grand Ave., Chicago 11, Ill. No letter will be published unless signed, but your name will be withheld if requested.

Nitrogen back-up?

Dear Sir:

Reference is made to the article on p. 57, Nov., 1956, issue entitled, "Atomic subs—one of welding's most important new jobs." A photograph on page 58 shows a weldor putting the root pass in a piece of pipe using an EB insert and the Tig (tungsten inert-gas) welding process. The caption mentions that the man is using nitrogen for his inert back-up gas.

I wish to question whether this is in error, or how one prevents the harmful effects of nitrogen in the molten pool. I would imagine that this would create a rather porous and brittle root pass.

R. H. Hoefler
Kaighin & Hughes, Inc.

—The caption is correct. In the picture nitrogen gas is being used to keep the inside of the weld clean by purging the oxygen away. Perhaps the source of confusion is the use of the phrase "back-up gas." The EB backing ring does the actual back-up in this weld joint.

Lincoln Gold Medal

Dear Sir:

I would like to invite your attention to an error in the article on page 61 of the November, 1956, issue of WELDING ENGINEER, dealing with the recent American Welding Society fall meeting and the Lincoln Gold Medal Award, in particular. Mr. H. C. Ludwig, who received the award this year for an excellent paper on "Nitrogen effects in argon-arc welding atmospheres," is a research engineer at Westinghouse Research Laboratories, Welding Section, Metallurgy Department, Pittsburgh. You erroneously report him as being affiliated with a competitive company.

J. Heuschkel
Westinghouse Electric Corp.

—Our apologies to Mr. Ludwig and Westinghouse.

30 YEARS AGO

(Taken from *The Welding Engineer* of January, 1927)

O. H. Dunbar and L. C. Monroe have assumed control of Blackwell Welding Co., Toledo. Blackwell Welding Co. was formerly operated by F. H. Fahle.

—30 YEARS AGO—

Burke Electric Co., Erie, Pa., has appointed H. C. Lemire, Minneapolis, a district sales agent for Minnesota, North and South Dakota and the northern part of Wisconsin.

—30 YEARS AGO—

Advertising lantern slides for job weldors have been prepared by Smith Welding Equipment Corp., Minneapolis. Each slide is in four colors, carries a picture and preaches the doctrine of have it welded. Single slides or complete assortment are all ready to be shown in the local theater.

—30 YEARS AGO—

The editorial page devotes a discussion to necessity of the engineering student studying welding. The thought is that questions yet unanswered will take those with inquiring minds far into the fields of mechanics, physics, chemistry and metallurgy.

—30 YEARS AGO—

A new group has been organized in Los Angeles to be known as The Certified Order of Weldors—COW for short. An educational organization, it will aim at certifying each weldor and to improving working conditions, without strikes. A member may be expelled for not being a gentleman and a weldor.

—30 YEARS AGO—

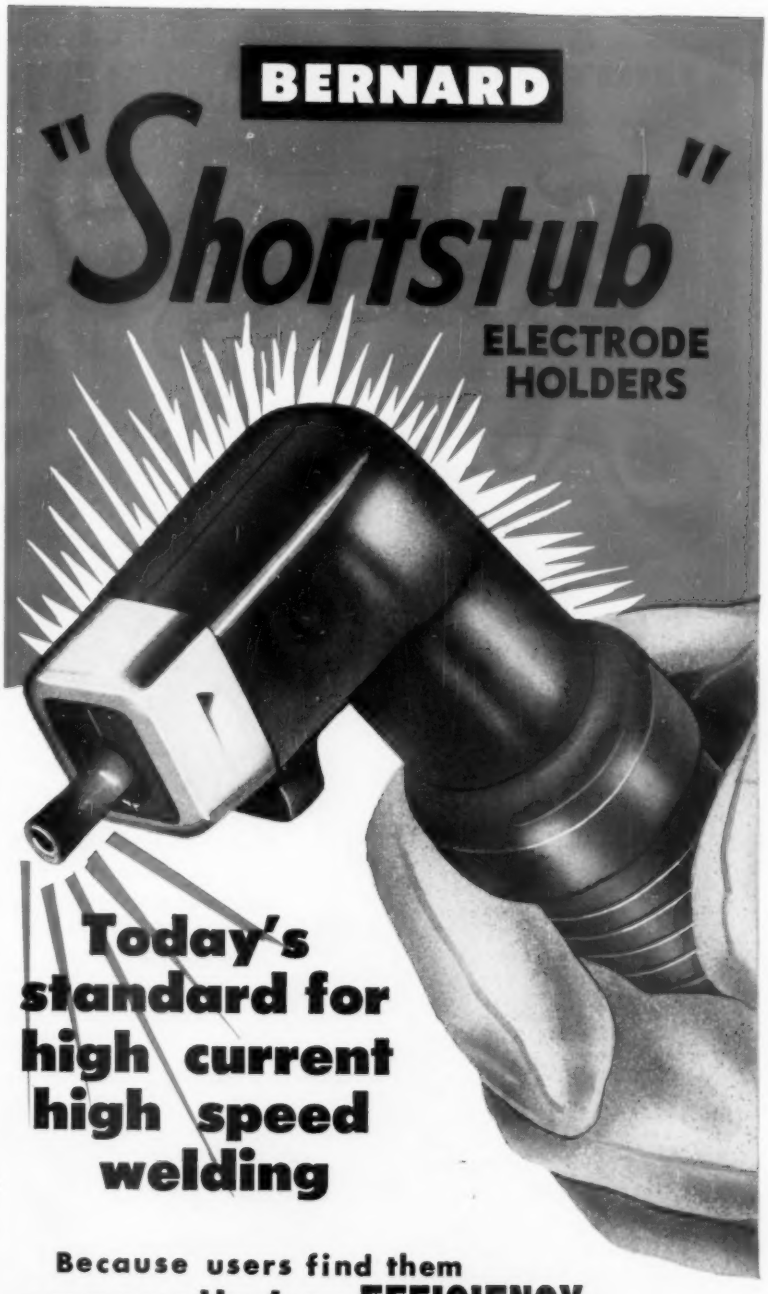
Seneca Electric Arc Welder Co., Seneca, Kans., recently held a special welding demonstration of electric arc welding in Detroit. W. E. Shafer, sales manager, reported the demonstration was a success.

—30 YEARS AGO—

The importance of oxygen and special chambers developed for hospital use are the subject of a news article.

—30 YEARS AGO—

W. F. Barrett has been elected a vice-president and G. W. Mead, a director by Union Carbide & Carbon Corp., New York City.



Because users find them
unequalled for EFFICIENCY
ECONOMY SAFETY and DURABILITY

PIONEER FOR BERNARD MODERN WELDING

SOLD THRU LEADING DISTRIBUTORS THRUOUT THE WORLD

BERNARD WELDING EQUIPMENT COMPANY
10232 AVENUE N, CHICAGO 17, ILLINOIS

THERE'S NOTHING ELSE LIKE FIBRE-METAL'S **NEW...FULL VIEW**

Solo goggle™

No. 55 "Solo goggle"... with adjustable elastic headband.

A "Picture Window" View and Maximum Safety for BRAZING, CUTTING, GAS WELDING, GRINDING and similar hazards.

COOL LIGHT COMFORTABLE

This NEW single-cup "Solo goggle" fits easily over Spectacle goggles and personal prescription glasses *for extra protection.* Molded of light, rugged plastic, "Solo goggle" is flame resistant and non-irritating to the skin. A *patented spring retainer* makes the filter lens and cover glass easy to change. The spring is of one-piece design . . . SAFE because it has no sharp ends or edges. "Solo goggle" affords a full, unobstructed view of work! *Order this newest and best eye protection NOW from your Safety and Welding Distributor!*

EXCLUSIVE Solo goggle FEATURES:

1) Wide "Picture Window" Vision.
2) May be worn slightly off-the-face ... with no annoying spring pressure.
3) Headrest has *padded* Leather or Leatherette Sweatband, smooth for comfort, easy to replace at low cost ... and
4) Wide Range Ratchet Adjustment to fit all head sizes.
5) Uses standard 2x4¼" Lenses ... easily replaceable without tools.
6) Entirely SAFE ... no spring ends or edges in eye zone!
7) Headrest with positive, single center adjustable linkage ... for simplicity and less weight.
8) Fits over all glasses.

INSIDE VIEW of "Solo goggle" ...showing *patented* (Designed for Safety) positive retention spring. Lens easy to replace.

No. F-550 "Solo goggle"... with Headrest for snug or ventilated off-the-face wear. Wide Range Adjustment fits any head size.

ASK YOUR SAFETY & WELDING SUPPLY DISTRIBUTOR for Bulletin #53, or WRITE .....

THE FIBRE-METAL PRODUCTS COMPANY

CHESTER, PENNSYLVANIA

THE WORLD'S LARGEST MANUFACTURER OF SUPERIOR PROTECTIVE EQUIPMENT

INSULATED EUREKA HOLDERS • HEAD REST GOGGLES • WELD CLEANING HAMMERS • FRESHAIR SYSTEMS FACE SHIELDS • SAFETY HELMETS

BETWEEN PASSES

sister, take a bow

This question has been kicked around for many more years than we have been in existence, but has it ever been answered satisfactorily? Why are ships, nations, etc., always referred to in the feminine gender? We bring this up again because we wanted to talk about our new *sister* publication, *The Welding Distributor*. (See, even magazines.) Anyway the *Distributor* makes its (her?) bow on Feb. 20, and will be published every other month from then on. Watch for this newest service publication, the welding industry's *only* merchandising magazine.

this is your career

"Engineering—a career for tomorrow" is a 16mm sound film which explains work and opportunities available in engineering. Produced by Eta Kappa Nu, electrical engineering honorary, the 23-minute movie is available in color or black and white. If you're interested in obtaining a print, write L. A. Spangler, Westinghouse Electric Corp., Merchandise Mart, Chicago 54, Ill.

in this issue . . .

. . . you will find the beginning of an educational series on resistance welding and basic stories on the arc and gas processes, as well. If we sometimes seem to forget that many of our readers are new in the welding industry, and if we sometimes tend to skip over basic principles, we apologize. It is sometimes difficult to remember that we have to go back to the fundamentals every once in a while . . . and it won't hurt you old timers, either, to read these "beginner" articles.

how now, brown cow?

One of the best wind indicators, according to the California Aeronautics Commission, is the everlovin' cow. Noting that these noble beasts always point their tails toward the wind, the Commission suggests ". . . remember to land facing the cows and you are into the wind. When they point in various directions, there is no wind." No word or hint about landing fields in areas devoid of cows. Here, we imagine, the old-fashioned windsock will have to do.

"Think you can find the incentive to go and see the movie for today?"

why not?

For automatic submerged-arc welding of irregular shapes, why not a hand gun attached to a shape-cutting machine? Many a fabricator has taken advantage of straight-line cutting rigs in this respect and converted them with semiautomatic welding guns, but irregular shapes are another problem. However, we recently published an article on the use of Mig in this manner, and we expect to have another story shortly on similar submerged-arc applications.

safety, safety, safety

Blame for two tragedies of the past month has been laid at the door of welding. The Brooklyn pier fire has been blamed on sparks from an oxyacetylene torch. Earlier, near Michigan City, two rescue workers trying to extricate two bodies from a wrecked diesel locomotive were killed, and several more injured, when oxyacetylene sparks ignited fuel in the locomotive tank. There seems to be no excuse for the latter accident . . . certainly someone should have remembered the volatile fuel. As for the Brooklyn incident, speculation is rife. More on this later.

wanted:

We read where pilfering is costing our industries around half a billion dollars a year . . . and that the average pilferer is 37 years old, married, and the father of two children. He is well liked, has the respect of his community and has worked for his company seven years. Our wonderment: with such a good description of the thief, how come he continues to get away with it?

good a reason as any

Did you happen to read about the check forger in the southwest who persisted, despite several slip-ups and subsequent captures, in writing bum checks on the Continental National Bank? Seems he found this bank's checks the "prettiest" of all those he used in his less-than-honest labors. The bank building is pretty, too. Back in July, 1956, *Welding Engineer* had an article on this all-welded structure, Fort Worth's tallest building, and said to be the tallest all-welded building in the world.

more on education

Latest news concerning industry aid to education: Effective Jan. 1, Western Electric Co., Inc., will pay $250 tuition annually for any employee who wishes to take accredited college courses pertaining to his job. As one employee put it, "It's like a $20 monthly pay raise, for now I'll be able to get my degree."

signs of the times

Seen on many San Francisco street corners: a sign reading, "I sold my auto engine through a *Chronicle* want ad." We hope he continues to advertise, and eventually sell the rest of his car.

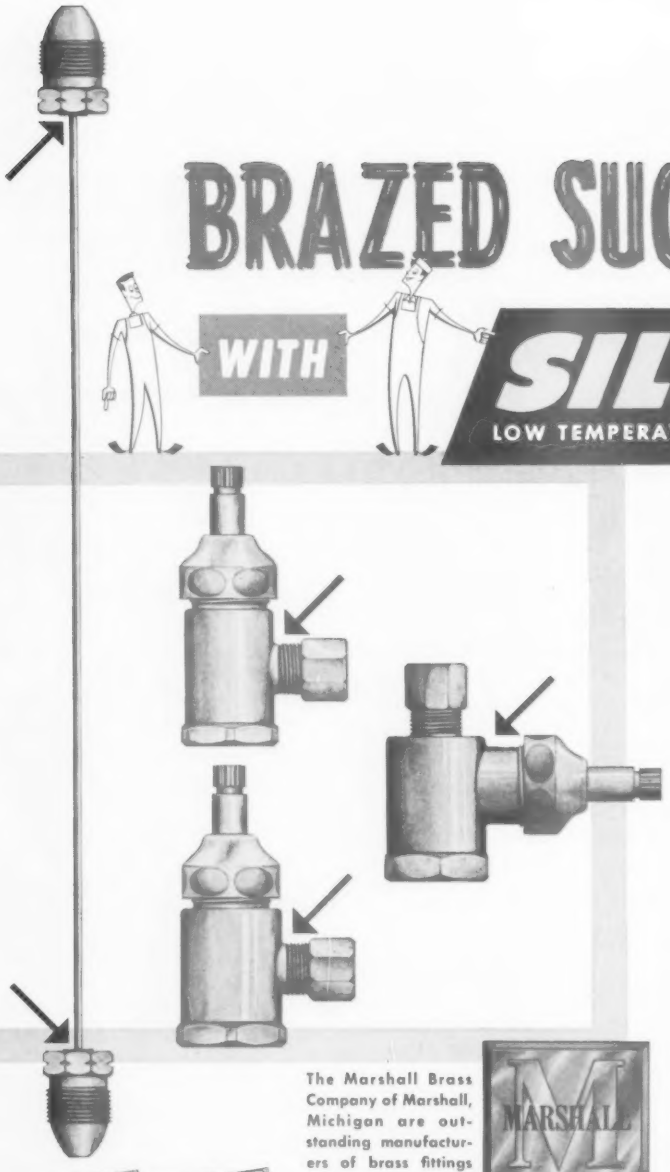
amen!

You can always spot a well-informed man when he talks . . . his views are the same as yours.

BRAZED SUCCESSFULLY

WITH SILVALOY

LOW TEMPERATURE SILVER BRAZING ALLOY



The Marshall Brass Company of Marshall, Michigan are outstanding manufacturers of brass fittings for gas, water and heating systems.

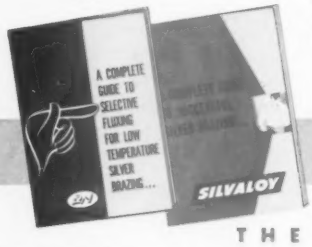
MARSHALL BRASS COMPANY

Here are typical examples of well-conceived engineering that improved product and product production while cost of manufacture was drastically reduced.

These Marshall Valve Bodies were formerly cast in one piece. They were then machined, ground and buffed at considerable cost. In the present procedure, the valve bodies and parts are produced on screw machine equipment, assembled and Silvaloy brazed. Grinding, and buffing are virtually eliminated. The joints are strong and leakproof . . . plating is easier . . . plating results are much improved.

The new method of manufacture is certainly highly successful. Rejects are kept below 1%—a far more favorable percentage than was possible when cast bodies were used. Savings in cost of manufacture have been estimated at approximately 35%.

Silvaloy Brazing Alloys arc APW Fluxes are helping to speed production, lower costs and improve brazing results in many fields. Call your nearest Silvaloy Distributor for information or technical assistance. ★ ★ ★ ★ ★ ★



FREE: These two complete reference manuals for low temperature silver brazing and fluxing are available upon request. Send for either one or both.

THE SILVALOY DISTRIBUTORS

BURDETT OXYGEN COMPANY
CLEVELAND • CINCINNATI
COLUMBUS • AKRON • DAYTON
YOUNGSTOWN • MANSFIELD • FINDLAY

MAPES & SPROWL STEEL COMPANY
UNION, NEW JERSEY • NEW YORK CITY

EAGLE METALS COMPANY
SEATTLE, WASH. • PORTLAND, ORE.
SPOKANE, WASH.

OLIVER H. VAN HORN CO., INC.
NEW ORLEANS, LOUISIANA
FORT WORTH, TEXAS • HOUSTON, TEXAS

NOTTINGHAM STEEL COMPANY
CLEVELAND, OHIO

EDGCOMB STEEL OF NEW ENGLAND, INC.
MILFORD, CONNECTICUT
NASHUA, NEW HAMPSHIRE

EDGCOMB STEEL COMPANY
PHILADELPHIA, PA. • CHARLOTTE, N.C.
BALTIMORE, MD. • YORK, PA.
KNOXVILLE, TENN.

PACIFIC METALS COMPANY LTD.
SAN FRANCISCO, CALIFORNIA
SALT LAKE CITY, UTAH
LOS ANGELES, CALIFORNIA
SAN DIEGO, CALIFORNIA

STEEL SALES CORPORATION
CHICAGO, ILL. • MINNEAPOLIS, MINN.
INDIANAPOLIS, IND. • KANSAS CITY, MO. • GRAND RAPIDS, MICH.
DETROIT, MICH. • ST. LOUIS, MO.
MILWAUKEE, WIS.

LICENSED CANADIAN MANUFACTURER
BAKER PLATINUM OF CANADA, LTD.
TORONTO • MONTREAL

THE AMERICAN PLATINUM WORKS

231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY

APW

ENGELHARD INDUSTRIES

Magnetic? OR Electronic? WELDER CONTROL — WHICH WILL DO YOUR JOB BEST?

Square D makes them all... for simplest or most exacting applications!

Magnetic

for General Purpose Machines

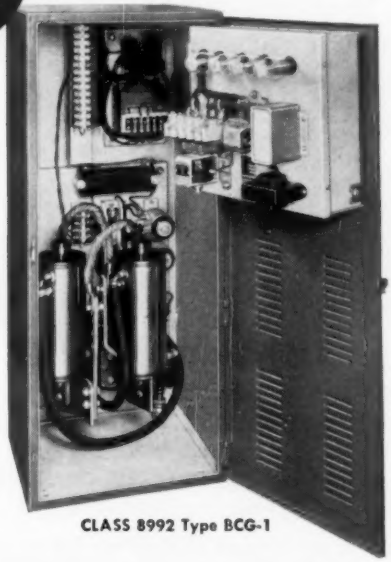
For applications requiring widely varying welding conditions, normal welding speeds and maximum simplicity.

CLASS 8992 Type BBG-1

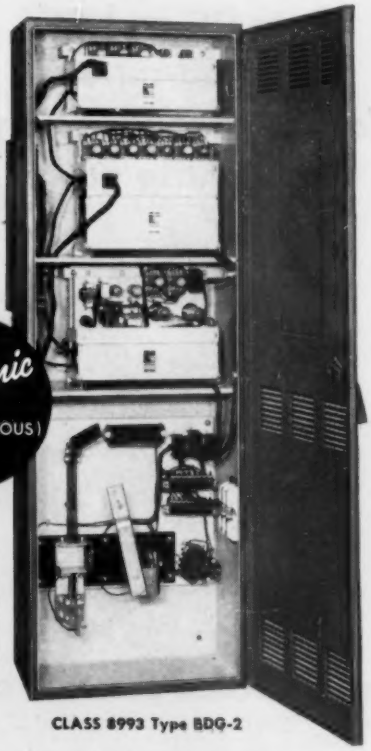
Electronic

for High Speed Welding

For production line (gun or stationary) welders and other applications where high speed, high currents or dual gun control are factors.



CLASS 8992 Type BCG-1



Electronic (SYNCHRONOUS)

for Precision Welding

For welding aluminum, other non-ferrous and ferrous metals requiring precision weld times; stepless heat control; slope or taper control.

CLASS 8993 Type BDG-2

You'll find your nearby **Square D Field Engineer** *a source of sound counsel in selecting the welder control best suited to your application.*

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

IDEALARC

by Lincoln

250 amp AC/DC arc welder

Both DC and AC welding current for the shop with only single phase power

DC for Versatility
welds mild and low-alloy, high-tensile steels, stainless, aluminum, bronze.

AC for Speed
with iron-powder electrodes and where arc blow exists.

DC for Easy Operation
with choice of polarity for sheet metal . . . for downhand or out-of-position welding.

AC/DC at Low Cost
for a price comparable to straight DC machines.

THE LINCOLN ELECTRIC COMPANY
Dept. 1724 • Cleveland 17, Ohio
The World's Largest Manufacturer of Arc Welding Equipment

SEND FOR BULLETIN SB-1364 giving specifications.

Fill out and mail to:
THE LINCOLN ELECTRIC COMPANY
Dept. 1724, Cleveland 17, Ohio

Send Bulletin SB-1364 on IDEALARC.

Name_____

Company_____

Street_____

City_____ State_____

Position_____

JANUARY, 1957

Welding Engineer

ESTABLISHED 1916

New year . . . new leaf?

A NEW YEAR . . . and let's hope this is the one in which structural engineers turn over a new leaf. In 1957, they could start saving money for their clients, and steel for their country, by designing for welding.

Structural engineering groups seem most reluctant to crawl out of their hidebound shells to join in the march of industrial progress. Their motto seems to be: "if it was good enough for grandpa, it's good enough for me."

All thinking in the structural design field, however, is not along these lines. On a recent visit to Texas, we were happy to note that at least 48 of the last 50 skyscrapers built in that great state have welded structural steel frames.

Structural welding progress in Texas and elsewhere should be sufficient evidence that welding is here to stay. What are engineers waiting for? Surely they cannot doubt the reliability of welding! *There are no records of failures in welded steel buildings.*

It has been proved that a welded structure requires less steel. Articles in WELDING ENGINEER have cited monetary savings of up to 30% where welding was used to join structural members in building construction. Why, then, isn't welding given greater use in joining steel structures for buildings and bridges? Is it because structural engineers and designers are too lazy to learn about modern metal-joining methods?

WE HAVE MET some of the backwoods group who are always ready to dish out their peculiar brand of tommy-rot. Welding hasn't been "proved," they say . . . or "there aren't suitable textbooks." Welding codes and standards always provide grist for their mill. They will, in fact, offer any lame-brain excuse rather than admit the truth: they are too indifferent to keep up with latest developments.

Reluctance to accept welding in the structural field is so widespread it often takes on the appearance of a conspiracy among steel producers, fabricators and engineers. If steel wasn't in short supply, some selfish interest in the steel industry might want to push welding farther into the background. When a steel structure is welded, the need for overlapping joints and heavy sections is obviated. Overlaps are necessary, however, where punched or drilled holes have robbed steel members of much of their strength.

THERE IS NOT enough steel (particularly structural steel) to go around at present, so steel-producing companies should seemingly be enthusiastic welding advocates. Are they?

This question might also be asked of the steel fabricator, who could save customers' money since most recent bids indicate that welding is the least-costly method for structural joining.

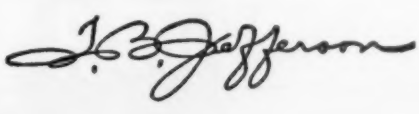
They cannot say that they are avoiding welding because punch presses and riveting equipment on hand are still operating. Not too long ago, one of the nation's largest steel fabricators opened a *modern* plant outfitted with such machines.

As for engineers, there are books, codes, standards and specifications—if they want to use them. True, engineering schools continue to teach budding engineers how to design riveted pressure vessels, even though industry probably has not built one for twenty years.

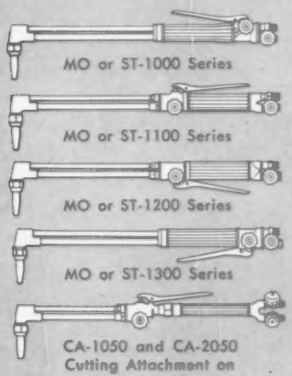
In every field but the structural one, welding has made mighty advances. So let's mark 1957 as the year in which we will sell ourselves to that area which affords welding its greatest growth opportunity.

Fatigue these structural designers and engineers with talk about welding's advantages. Pull, twist and bend them if you must . . . X-ray their mental reservations and show them the flaws in their thinking.

Bigger things are coming in the structural field—and welding *must* be there to do the job the right way!



CHOICE OF LEVER POSITION



Select either Monel (MO) or forged bronze (ST) head; available in four lengths: 21", 27", 36" and 48", with 90°, 75° and 180°. 45° on ST models only. Same design features contained in cutting attachments, with forged bronze head.

OPERATORS PREFER
this torch for hot, tough jobs!

LICK YOUR HOTTEST JOBS

. . . solid stainless steel mixing tube absorbs heat slowly, keeps gases below flashpoint.

LAST LONGER UNDER ROUGH, TOUGH USE

. . . because they're made of toughest materials . . . special heat resisting bronze heads, forged brass bodies.

EASIER TO HANDLE, EASIER TO MAINTAIN

. . . hand-fitting oval shaped grip . . . well balanced for ease of handling . . . practical design for ease of service after long use.

Make your tough jobs easy, your easy jobs a pleasure . . . see your Victor dealer now!

VICTOR for welding

VICTOR EQUIPMENT COMPANY

Mfrs. of welding & cutting equipment; hardfacing rods, blasting nozzles; cobalt & tungsten castings; straightline and shape cutting machines.

844 Folsom St., San Francisco 7 • 3821 Santa Fe Avenue, Los Angeles 58

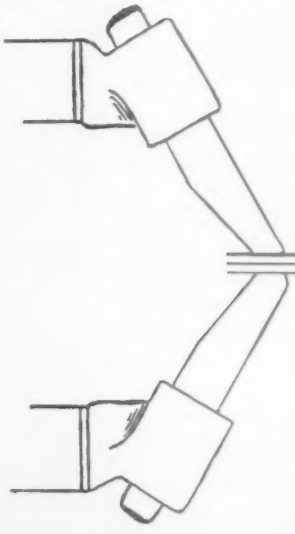
Welding Engineer

News reports . . . application articles . . . success stories. All have their place in *Welding Engineer;* actually, they represent the great balance of material published each month in this magazine.

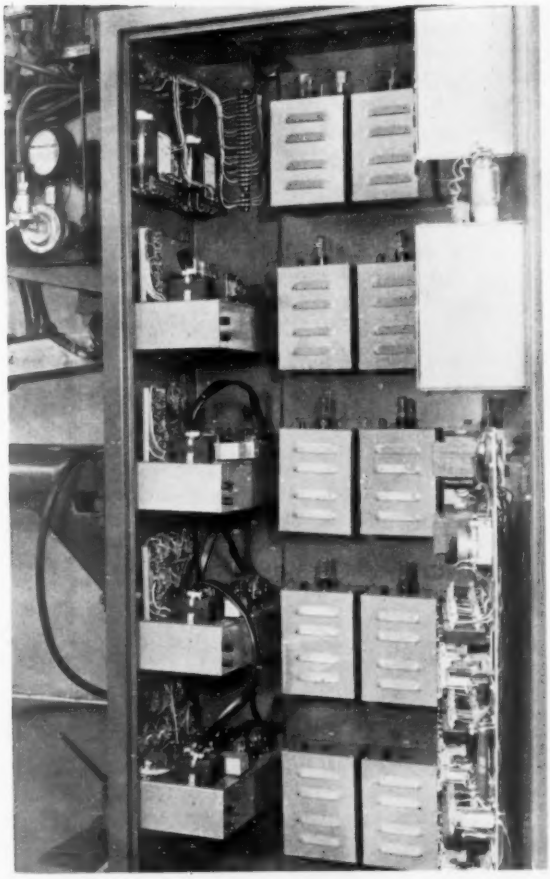
To give readers something special in 1957, however, we have programmed new features that provide a fresh approach to elemental welding facts. These articles on gas, arc and resistance processes are intrinsically educational. As such, they should give welding's newcomers valuable information to supplement on-the-job training. They should also bring industry old-timers up to date and re-acquaint them with lessons learned . . . but forgotten.

But there is still another major mission we hope these articles will accomplish: the creation of a desire for welding's advancement. It is an education in itself to learn how dependent industry growth *is* upon the unqualified—and vocal—support of men in the field. Even constant expressions of confidence in welding processes can perform small, *but related,* miracles . . . transforming enemies into friends.

SEAM WELDING: The resistance process that employs wheels as electrodes—and as pressure-clamps for workpieces. The weld made by this process is actually a series of overlapping spot welds made by wheel rotation.



Resistance Welding



COMPLEXITY: A suitable synonym for modern resistance welding machine controls (shown installed at left). Both controls and other materials, however, when properly applied, simply mean better welds.

This article forms the basis for a series dealing with fundamental information on, and concepts of, resistance welding machines, controls, equipment and usage. Watch for these valuable and timely presentations throughout 1957 in WELDING ENGINEER.

The past and present

By Jack Fairlie

RESISTANCE—the strange and fortunate opposition offered by a substance to the passage through it of an electric current.

Here, as briefly as it can be stated, is the principle which guided Elihu Thomson in the experiments which netted him the first U. S. patent (1885) for a resistance welding machine.

Following in Thomson's footsteps since 1877 have come thousands of research scientists, engineers, manufacturers and consumers—each responsible for the continuing growth and perfection of resistance welding, and each, in his turn, as obligated as Thomson was to the limitations, and the illimitable promise, of a simple physical law.

Low Voltage, High Amperage

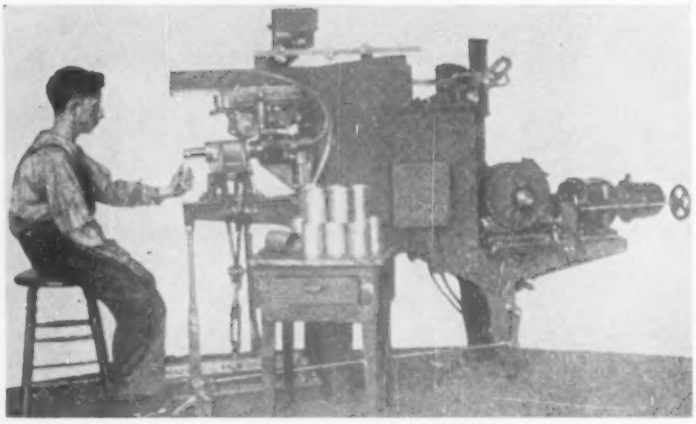
The first machine invented by this American pioneer was a small, low-pressure unit. Like all resistance welding machines to follow, it utilized a low-voltage, high-amperage principle.

Current was carried through a copper conductor (electrode) which offered little resistance to electricity until it reached the workpiece. Here, resistance began in earnest, and heat was generated in volume.

As heat of workpiece reached a point which, in the operator's opinion, approximated welding temperature, pressure was applied and the heated metals were forced together. This same sequence of events, with minor exceptions, is followed today. But timing is rapidly becoming a precise and automatic factor; as a result, resistance welded items are gaining a well-deserved reputation for soundness and strength.

There have been changes in resistance welding in addition to timing improvements. Basically, what began as a single process has now multiplied to six: spot, seam, projection, flash, upset and percussion welding.

Thomson's machine was a butt welder; many of the machines produced by competitors in the years which followed were also butt welders. But there were still further developments before World War I.



ON a similar application (coffee pots) a young girl weldor is said to have accidently uncovered the projection welding process. This unit, however, is a motor-driven seam welder which could join a 12-in. seam in five seconds. It was made in 1916 by Toledo Electric Welder Co., Cincinnati.

Projection and flash welding methods were stumbled upon. The former process came to light, we are told, during the dreamy operations of a coffee-pot weldor—an anonymous young lady with a reputation surpassed only by the legends of Betsy Ross and Barbara Freitchie.

This fabled lass welded oversize spouts to a batch of coffee pots. A row of projections had been made on the pots to aid in positioning proper-sized spouts . . . insurance, so the manufacturer thought, against this very error.

These hybrid welds had uncommon strength, the story relates, and the manufacturer was quick to give his employee her come-uppance while cashing in on the discovery himself. But such tales have a way of assuming new character through the years. Who knows . . . perhaps the girl with the high-button shoes was putting into effect a few theories of her own!

An experimental accident in 1913 by a Mr. Kleinsmith of Lorain Steel Co. has been credited as the basic development of flash welding. According to Malcolm Thomson, son of Elihu, Mr. Kleinsmith increased primary voltage of his welding machine to speed up operations. A sparking resulted which this pioneer managed to maintain. He called the process "spark" welding; we know it today, in a modified form, as flash welding.

Seam Welding Trials

Experiments in seam welding were being conducted by inventors throughout the country, but the process was unsuccessful as a commercial venture until 1926. Various current-interrupting devices helped speed acceptance of seam welding.

By 1923, there were 10 firms manufacturing resistance welding equipment; today there are over 60. But problems plagued the new industry . . . big problems that might have beaten men less convinced of the worth of their cause than were those who produced early resistance welders.

There was the matter of timing. Skilled operators were hard to find . . . harder still to train. An operator's poor sense of timing led inevitably to poor welds that broke down in later use. There was little or no weld testing, so joints had to be judged on the faulty basis of appearance alone.

There was the matter of pressure. This variable could make or mar weld joints between parts heated to a highly-accurate degree. Spring-rigged clamps could slam parts together with destructive force, or fail to exert pressure sufficient for a good joint.

Problems of Power

These factors, however, popped up only after installation, a really big problem in itself. U. S. industry, at the turn of the century, was just beginning to forge the tools of a new era. This titanic growth demanded power in equal dimensions, but utility firms offered only (*a*) direct current, and (*b*) very little of that.

Average size of an early butt welder was 15 kw, but machines ranged in size up to 60 kw. All of these units had to be accompanied by the installation of an alternator and a rotary converter or motor-generator to supply alternating current.

In view of existing power supplies, the 60-kw machine was considered tops in size and power demand. John and Horace Dodge quickly discredited this belief by installing a specially-built 100-kw machine in their automobile plant.

This unit barely met requirements of the manufacturing process for which it was designed, and an even larger welder might have been immediately considered had it not been for the fact that power demand of the 100-kw unit consistently blew the main fuse.

Competitive Threat

In the face of power discontinuation threats by the utility firm, John Dodge retaliated with a well-conceived ruse, letting it be known that he might build his own power plant. The effort was successful; electrical supply in quantity ceased to be a major problem for the Dodge brothers, and for many other users of the time.

Extremely heavy power demands made by modern resistance welders will be viewed more closely in a later article.

Introduction of the spot welder in the early years of the 20th century was a boon and a bane to the cause of resistance welding. A new patent issued on this further refinement of early butt welding led to years of industrial strife and bitter court litigation.

Solution to the patent problem was given in 1924, when the Supreme Court decreed that Elihu Thomson's original patent had disclosed all forms of resistance welding. This ruling invalidated the Harmatta spot weld-

ing patent and blew fresh air upon a stifling industrial situation.

Among early users of spot welding were Budd Co., Truscon Steel Co., and Barney & Berry Co. Auto bodies, steel columns and skates were some of the products fabricated by this new and fast resistance process before 1915, and applications increased rapidly thereafter.

But speed was still tempered by the sobering reality of inconsistent weld quality—the factor that prevented resistance welding from matching its potential.

The development which might have brought the resistance industry out of its "dark ages" in the '20's, but which did not measurably influence these welding processes until later, was the electric control apparatus.

This ingenious invention, brought to light in 1924, provided an unseen answer to timing and pressure control problems. Acceptance was slow, but it was obvious to all who cared enough to invesigate that a combination of ignitron and thyratron tubes could create and sever heavy welding currents and regulate ignitron firing points.

Cutting a second into 60 units, called cycles, electronic controls time weld duration and introduce continuous cycles of squeeze time, weld intervals (with heating and cooling times), hold time and off time.

Formation of RWMA

It was during the period of control development preceeding World War II that many resistance welding equipment manufacturers wisely banded together to provide themselves with a consistent outlook and approach to mutual problems. The Resistance Welder Manufacturers' Association is today comprised of 18 major equipment manufacturers.

As localized European conflict erupted in 1939 into World War II, the resistance welding industry was introducing a new development that was to shoulder a sizeable portion of U. S. war production until 1945. This was the stored-energy machine which drew a balanced load from power lines and enabled manufacturers in short-power areas to enter the war effort with gusto.

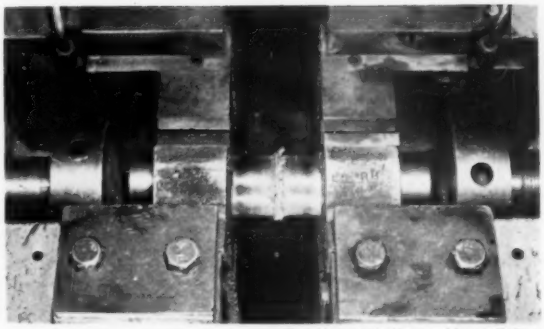
But resistance welding horizons were not obscured by the clouds of war. New and larger machines were on the drawing boards and in production as the war drew to a close. Press-type welders, heavy-duty aluminum and tubing welders, multiple-spot welders and room-size flash welders all awaited the conversion from war-to peacetime production.

As noted, these machines were large—too large and too power-hungry to be operated even on a stored-energy principle. Another principle of power usage was needed, and some machines had it—three-phase operation.

Two Popular Types

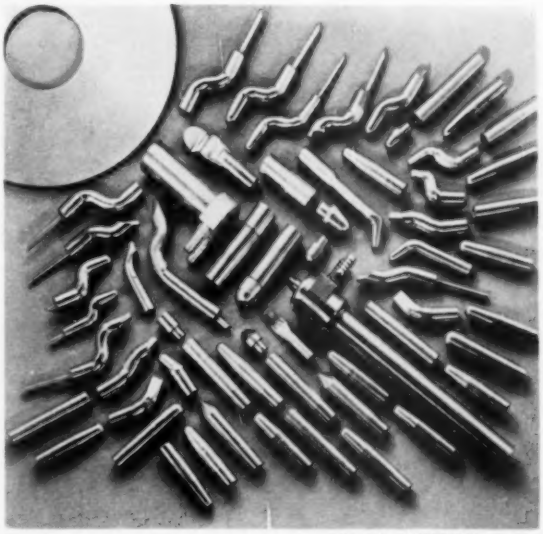
Types of three-phase units to be found on the market have changed rather rapidly as on-the-job applications have proved-out or virtually eliminated various models. Survival of the fittest is the age-old law which has narrowed current popular choice to two machine types: the frequency converter and metallic rectifier machines.

Both machines draw power only while a weld is being made, and both distribute welding load equally over all three phases of the power supply. This attribute gives three-phase machines their distinctive designation.



—Courtesy Northrop Aircraft, Inc.

CLOSE-UP of test coupon illustrates the principle—and results—of flash welding. Bars, heated to forging temperature by arcing between joint faces, are then forced together by screw-type rams on either side. Upset metal contains slag and other impurities forced from joint faces during impact. Clamps holding bars serve as electrodes.



—Courtesy WW Alloys, Inc.

VARIETY of available electrodes for resistance welding processes is ever changing to meet highly-specialized industrial demands.

Though it can be pointed out here that both machines find application in seam, spot and multiple-impulse welding, further definition and description of their operations will be given in a subsequent article in this series.

As a related group of metal-joining processes which have proved their efficiency, resistance welding methods are enjoying increased acceptance wherever they can practicably be applied. Backing up this statement are the figures which show a $19 million increase in 1955 sales over those for 1954. Over $50 million was spent on resistance welding equipment in 1955.

The resistance welding industry, as the year 1957 begins its 365-day engagement, is feeling for perhaps the first time a mature glow of success. Days of pioneering still lie ahead, but days of wildcatting are past.

Thyratrons, ignitrons and dekatrons have replaced handles and pedals; Thomson's idea is now a full-fledged science.

The "bird watchers" of Ryan Aeronautical Co. performed a valuable service—but they've had their day. The unblinking eye of the television camera now aids in the control of weld quality.

TV spots build-up on resistance electrodes

TV screen at right of machine magnifies spot welds on underside of plate 5 times, helping operator spot aluminum build-up on electrodes.

LIKE the combination of English muffins and Irish stew, television and spot welding—at first glance—don't seem to have much in common.

Perhaps to no one's surprise, however, a leader in modern welding usages is currently employing a TV camera to keep a spot welding machine operator advised of detrimental build-up on lower electrodes while joining large aluminum sheets.

Ryan Aeronautical Co. of San Diego is the fabricator which inaugurated this electronic quality controller. TV now substitutes for a man whose job it was to sit beneath plate sections as they passed over the lower electrodes and keep an eye on welding tips.

The sections being joined have a hard aluminum-alloy core. Cladding, however, is pure aluminum to afford protection against metal corrosion. This pure material is picked up rather easily by electrodes, causing a decrease in quality in subsequent welds.

"Bird watchers" (it didn't take Ryan employees long to find a humorous designation for electrode checkers) did their job well, but methods and production engineers found no solace in their presence. Quality control was obviously being

achieved at the expense of uneconomical labor practice.

Three substitute programs were given thorough consideration by plant engineers: mirrors, prisms and optical lenses, and closed-circuit television. TV's accuracy and clarity won hands down.

17-in. Screen

A continuous, magnified view of lower plate welds is now fed via coaxial cable to a 17-in. TV screen next to the machine operator. This man now has a complete view of all welds made by his machine, and he knows instantly when clad pick-up begins.

Installation problems were eased somewhat by the fact that no aerial was necessary. Parts passing through the welder, however, have a four-way movement that created a changing field of vision. The answer to this was correlated camera movement—effected by an arc and simple bracketry.

Lighting was a puzzler and demanded highly accurate experimentation. A combination of fluorescent and incandescent flood lights proved most successful in limiting the glare of aluminum and the hour-glass weld reflections.

The TV camera, which is supplied on a contract basis, is remotely controlled by the machine operator. Immediate replacement has been guaranteed by the supplier to avoid production delays.

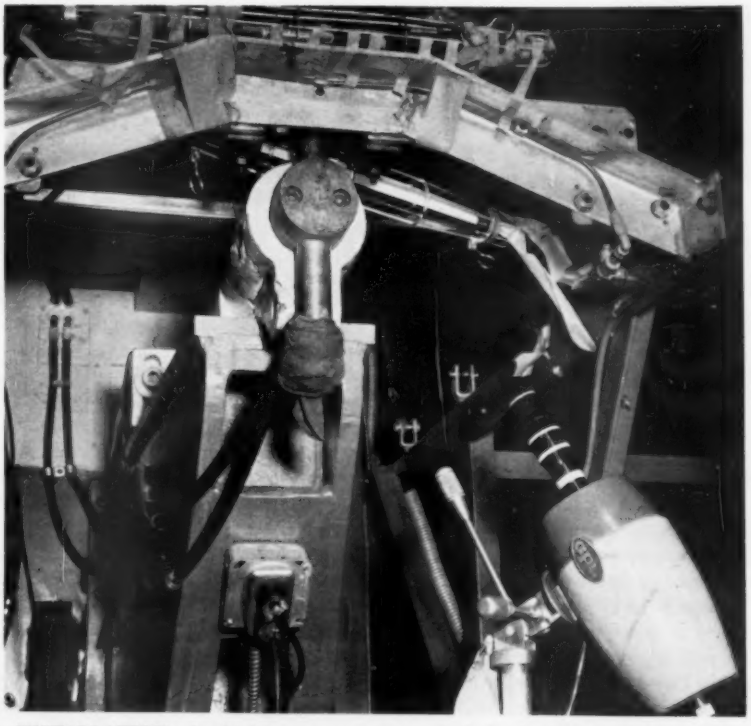
Two Lenses Used

An added benefit has been gained through use of the camera since it has both close-up and wide-angle lenses. The close-up lens, naturally, is employed during welding for a detailed image. When removing work from the narrow space between electrodes, however, the operator can switch lenses and gain a wider view that helps prevent damage to electrode tips.

Noting that TV has already proved its value to Ryan, Don Post, assistant supervisor of methods engineering, has stated that system refinement "will continue for as long as we use it."

Post pointed out that the new system has freed a skilled worker for more productive work, and has improved quality by spotting clad pick-up instantly and accurately. Spot welds are enlarged to 5 in. on the TV screen.

"BIRD watcher" developed a real pain in the neck as he spent his days watching underside welds on large aluminum sheets. Pure aluminum cladding was picked up by spot welding electrodes and damaged weld quality.



INSTALLATION of television camera not only helped operator detect build-up on electrodes, but also aided in safe removal of welded sheets without damage to narrowly-spaced electrodes. Lights are taped to machine.

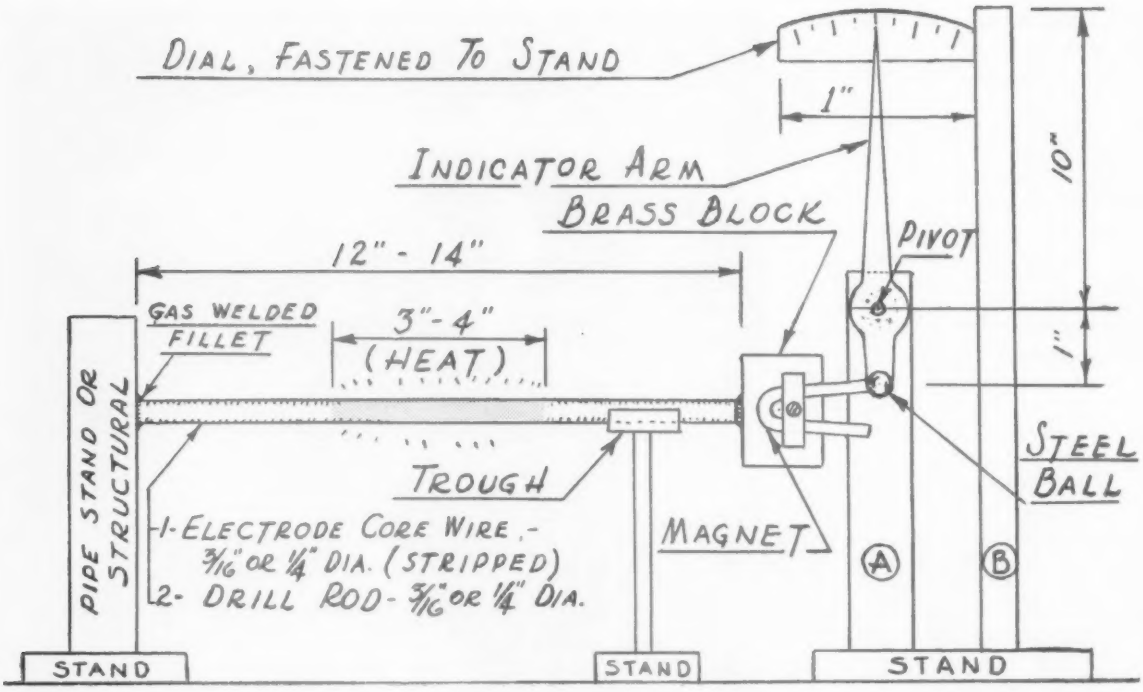


FIGURE 1: Forces of expansion and contraction can be measured in this simple two-step experiment. Core wire of E6010 electrode and section of drill rod are consecutively brazed to brass block; a magnet is fastened to block with brass strap. A ¼-in. ball bearing (or larger) is soldered to bottom of indicator arm for contact with one leg of magnet. Trough-like guide prevents rod from sagging when heated. Segments *A* and *B* are uprights (pipe or bar) to hold indicator arm bearing and dial.

Arc welding defined

Learning to work with weldability

By Bela M. Ronay

TO DEFINE for almost everyone's satisfaction the meaning of the word *weldability*, it is perhaps best to first define the true nature of an arc weld.

Such a basic definition is not so superfluous as some may think. The ability to make sound welds consistently demands more than skill; the mechanics of arc welding must also be understood.

Some weldors are content to view an arc weld as simply a glob of molten metal in a joint—and not as a super-strong *cast ingot* which they alone can correctly mold. These are weldors who continually practice the same techniques on all metals with the same average-to-poor results.

Accepting the fact that an arc weld is an electrically-produced cast ingot—poured slowly in layers into the *mold* formed by joint edges—is basic to further appreciation of the inherent variability and unlimited usefulness of this joining process.

What happens as molten weld metal is laid in its mold is actually Step No. 1 in this lesson on arc welding. But it is a step which can best be learned in its relationship to various steels—and to their weldability, since it is directly controlled by this latter factor.

Weldability: Mild Steel

A root pass, the first "cast" layer of an arc-welded ingot, begins to contract the moment it is laid in a joint. This shrinkage—the outward sign of normal solidification—pulls the parts which form the joint (mold) together.

Should these members be free to move, the contraction factor is readily satisfied. If members are restrained (*i.e.*, not free to move), weld metal and base metal softened by arc heat must stretch sufficiently to satisfy contraction.

Pattern makers, with their practical knowledge of contraction factors, allow 0.25 in. per foot for shrinkage in steel castings. Using this same ratio, we find that a root pass weld 0.25 in. wide shrinks $\frac{1}{4} \times 0.25 \div 12$—or 0.005 in.

The most commonly welded material—mild steel—can readily satisfy this demand, even in the form of weld metal. Narrow bands of mild steel parent metal surrounding a weld contribute a proportional share of *stretch* to compensate the otherwise detrimental forces

of weld metal contraction.

Whether at white heat or room temperature, mild steel retains its ductility—its ability to stretch without cracking.

Multi-Pass Joint: Unrestrained

With a root pass in place, the joint has lost some freedom of motion. Unrestrained materials, however, will move again as the second pass is deposited. Heat of this weld metal reheats the first layer, causing it to expand and to counteract shrinkage beginning in the second layer.

This balance is lost momentarily, however, as heat is conducted from the second layer to the first, and root pass metal pushes joint edges outward. The relatively cool second layer acts as the pivot of a hinge in this action, and the result is *warpage.*

As temperatures of both passes equalize, this action ceases and volumes of both layers cool and contract uniformly. Only transverse weld shrinkage occurs thereafter.

The amount of warpage which has been introduced into the joint will remain unchanged as the weld cools. Its ultimate effect will be treated later in a discussion of final alignment of weldments.

Multi-Pass Joints: Restrained

The second weld pass in a joint whose members are restrained in all directions again raises temperature of the root pass to the point of expansion. Such free action is impossible, so the first layer suffers compression while volume of the second layer continues to shrink.

Such interaction (*i.e.,* contraction and compression) continues until both layers attain equal temperature, at which point both shrink uniformly. Volume of the first layer which has already undergone compression, however, is now exposed to further volume reduction by shrinkage.

The initial layer resists this reduction, in part, by putting greater shrinkage load on the volume of the second layer. Mild steel parent metal meets this increased weld metal deformation demand by stretching to satisfy the contraction factor. *And it does this without cracking.*

As welding continues with third, fourth and fifth passes and more, however, the situation increases in complexity. With an increase in weld metal depth and volume, effect of heat input from the new deposits on earlier passes decreases in importance.

Previous deposits still expand somewhat and tend to resist shrinkage of the fresh deposit. But expansion in the bulk of weld metal in lower layers decreases sharply as temperature rise tapers off. This situation increases resistance to shrinkage of freshly-deposited weld metal.

Heat-Affected Zone

Fortunately, mild steel as a raw casting (and each fresh pass is just that) has the ductility to satisfy this shrinkage demand. There is, of course, a limit to this ability, as indicated by lessons learned in welding mild steel over 2 in. thick.

Until the weldor passes this critical joint thickness, however, the remarkable behavior of the *heat-affected zone* in a mild-steel joint enables him to secure a sound weld with no severe stress problems.

The heat-affected zone is that narrow strip of base-metal adjacent to parent material melted during arc welding. Metallurgically, it is part of the weld since it no longer resembles base metal. Heat-affected zones in mild steel, however, retain a degree of ductility which causes them to behave in the same manner as unaffected base metal.

Performance of restrained and unrestrained mild-steel joints, plus the fact that this metal does not require preheat to prevent crack development, indicates that mild steel has *normal weldability* in arc welding. Weldability is good, in fact, for all metals which expand when heated and contract on cooling—*remaining ductile at all temperatures during cooling.*

(There are weldability requirements other than these which are enforced to meet specific purposes. They are beyond the fundamental area covered in this article, however, for we are concerned with arc welding without reference to code requirements demanding engineering appraisal.)

Weldability: Low-Alloy Steel

Complications which affect weldability are present in joining medium-carbon and low-alloy steels. In the course of cooling, and at a definite temperature, these steel types suddenly stop contracting. For a brief period at this transition point, these steels expand without further temperature drop, then resume normal cooling and shrinking.

Effects of this behavior can best be seen by starting again with the root pass in a low-alloy steel joint. For this example, the steel will be 5% Cr—½% Mo alloy.

Totally unrestrained joints will behave in a manner similar to those composed of mild-steel members. Root pass weld metal and heat-affected portions of a restrained joint, however, stop shrinking when temperature falls to about 800 F (a figure applicable only to the particular alloy cited; it does not apply to all chrome-moly alloys.)

There is, therefore, hesitation without temperature drop. During this period, weld metal expands at a rate somewhat faster than normal shrinkage rate. Then, at about 700 F, weld metal again begins to shrink.

Lacking Ductility

This brief expansion, occurring under restraint, compresses the bulk of weld metal. When cooling—and resultant contraction—resumes, the now-compressed weld metal is expected to stretch.

A clever technician can weld almost any metal or alloy, but how often can these individual procedures meet production requirements? Here are some pointers and simple experiments which can save time and money by aiding in the quick pre-determination of weldability factors in common and uncommon steels.

In future issues, Mr. Ronay, who recently retired as superintendent of the U. S. Naval Engineering Experiment Station's welding laboratory, will discuss joint design, welding process and material selection, equipment, and other fundamental arc-welding factors.—The Editors.

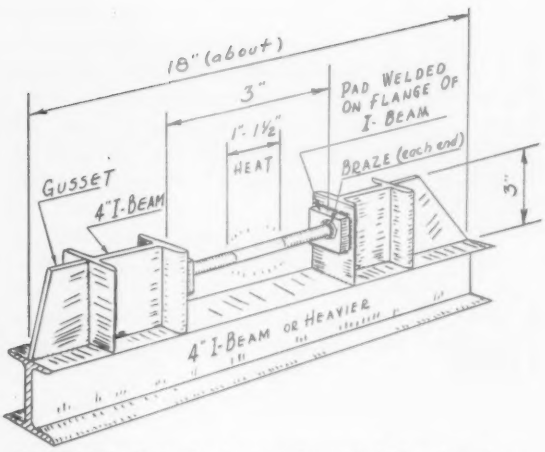


FIGURE II: Restrained core wire and drill rod sections will react to heat in marked fashion. Core wire, ¼ or ⅜ in. in diameter, will thicken in center upon cooling; drill rod may fissure. To aid development of this effect, notch rods with file to depth of 0.005 to 0.0010 in. Mild steel core wire will not fissure, but drill rod may fracture completely.

A critical factor which presents the major complication at this point is simply that, in its as-cast condition, 5% Cr—½% Mo alloy steel does not have the degree of ductility possessed by mild steel. As a result, increased contraction (on weld metal compressed during the period of hesitation in cooling) may crack the first pass.

This same situation reoccurs with greater intensity in later passes, particularly on restrained joints. The reason, obviously, is that the critical 800 F temperature level is reached more quickly in the existing weld metal than in the fresh deposit. Expansion of the former takes place while the latter is still contracting.

Freshly deposited metal cannot resist the expansion force of the cooler *and tougher* weld metal in lower passes. Result: usually a crack down the center of the joint.

Ultimate failure, then, greets the weldor who attempts to join this particular low-alloy steel with a welding procedure similar to that used on mild steel.

Demonstrating Peculiarities

The practical man, without formal metallurgical training, may be unfamiliar with certain properties of low-alloy and medium-carbon steels. He may doubt—with reason—that a steel stops cooling and contracting, then actually expands before resuming normal behavior.

This unfamiliar occurrence in a low-alloy steel is similar in some respects to the behavior of water when boiled in an open saucepan. Temperature of the water, after reaching 212 F, remains constant until contents of the pan have boiled off. This is true even if heat input is increased tenfold or more.

This parallel example may satisfy some, but for those who wish visible proof, the experiments presented in sketches accompanying this article may be conducted in most work shops without the need for extraordinary tools or instruments.

Fabrication details given with the assembly in Figure I are sufficient for its construction, with one exception: the indicator should be mounted on a ball-bearing. If a sleeve-bearing is used, clearance must be very fine.

The steel ball at the bottom of the indicator arm forms a smooth, sliding joint with the magnet, making the indicator arm respond to minutest motions of the expanding or cooling rod without lost motion. This magnet coupling eliminates mechanical linkage between rod and indicator arm.

E6010 Core Wire

Materials for this first experiment, in addition to the assembly, are a 3/16 or ¼-in.-diameter E6010 electrode with coating removed, and a piece of drill rod of similar size. The coating can easily be removed from the electrode if it is soaked in hot water for an hour.

Place the mild-steel core wire in the assembly and join it to the stand at one end with a fillet weld; thread the other end into the brass block. Heat a 3 or 4-in. area in the middle of the rod to a bright straw color, then let it cool to room temperature. Cooling may be accelerated by air-blast in the heated zone.

Watch the dial when heating, but especially during cooling. The indicator, after reaching the final position gained during heating, will return *without hesitation* to its original room-temperature position.

After substituting the drill rod and heating it in the same way, note that the indicator stops at some point when the rod lost color. Having stopped, it briefly reverses direction and climbs upward before dropping back to room temperature. Effects of this behavior are demonstrated by the experiment in Figure II.

Materials for this second experiment are a ¼ or ⅜-in.-diameter E6010 core wire and a similar-sized drill rod. After heating the core wire again to a bright straw color and allowing it to cool, feel for a slight thickening in the middle of the heated zone.

Measurement with micrometer before heating and a remeasurement afterward will give positive indication of heating effects on mild steel under restraint.

Fissures During Cooling

The welding rod is now replaced with the drill rod, and heating is carried out as previously described. The rod, a medium-carbon or alloy steel, may not yield sufficiently on cooling to compensate for thickening developed during heating, and the secondary thickening which occurs during the short period of expansion while cooling.

Not having mild steel's ductility, it may fissure during cooling at the point when heat color is lost. A sharp metallic *ping* announces fissures, which may be visible to the naked eye. Magnification will reveal them more sharply.

If the drill rod is an alloy, rather than a medium-carbon steel, it may fracture at the center.

Upon completion of these simple experiments, the operator will possess a comprehensive understanding of the forces involved during the welding of *restrained* medium-carbon and certain low-alloy steel joints.

The experiments themselves are the initial stage in the development of a method for determining welding procedure for low-alloy or medium-carbon steels. The method, which will be presented in this series of articles, will use tests designed to indicate whether costly pre- or postheating are necessary to restore to welded areas a ductility comparable to that of un-welded base metal.

INSPECTION of four nickel-clad tanks designed to carry 73% caustic soda revealed no evidence of weld failure in pure-nickel pipes.

ANODES were held in place by stud bolts position-welded on outer hull plates. After 2½ years of service, stud bolts are still in good condition.

Hell and high water couldn't lick these welds!

THE SS *Marine Dow-Chem*, the first vessel designed specifically for transport of liquid chemicals, was inspected recently at Todd Shipyards in Brooklyn.

The 18,000-ton vessel is 551 ft long, with a 68-ft beam, and it can travel at 15 knots. Operated by Marine Transport Lines, Inc., New York City, it has carried varied chemical cargoes in 24 center tanks since its launching 2½ years ago.

During inspection, special interest was focused on four of the tanks (located near the ship's stern) which were designed to carry a 73% caustic soda solution. These tanks were constructed of 10% nickel-clad steel welded with coated nickel electrodes. WELDING ENGINEER presented fabrication details in its April, 1954, issue.

Inspection from hatches down to bottoms of the hold revealed that the nickel-clad tanks exhibited no signs of corrosion or other defects. The ship's captain said there had been no evidence of corrosion, weld failure or fracture in the tanks, which have a capacity of 632,000 gal.

Standard Joint Design

He went on to say that the cargo had always been delivered in as pure a form as it came from the plant. Everything looked almost exactly as it was when the ship was new, including tank surfaces, heating coils, ladders and welds.

The caustic soda tanks, averaging approximately 39 by 22 by 28 ft each, were fabricated by several welding processes using nickel filler wire. More than 685,000 lb of nickel-clad plate and 47,000 lb of pure-nickel pipe, valves and fittings were consumed in fabrication.

A standard joint design for welding nickel-clad steel was used on all the tanks. It was a double vee with a 60-deg included angle on the steel side and a ⅛-in. nose on the nickel side. Edges were machine-planed to insure perfect fit-up.

Some of the pipe used was 10 in. in diameter with a wall thickness of ⅜ in. It was formed from flat plate and submerged-arc welded.

Magnesium Anodes

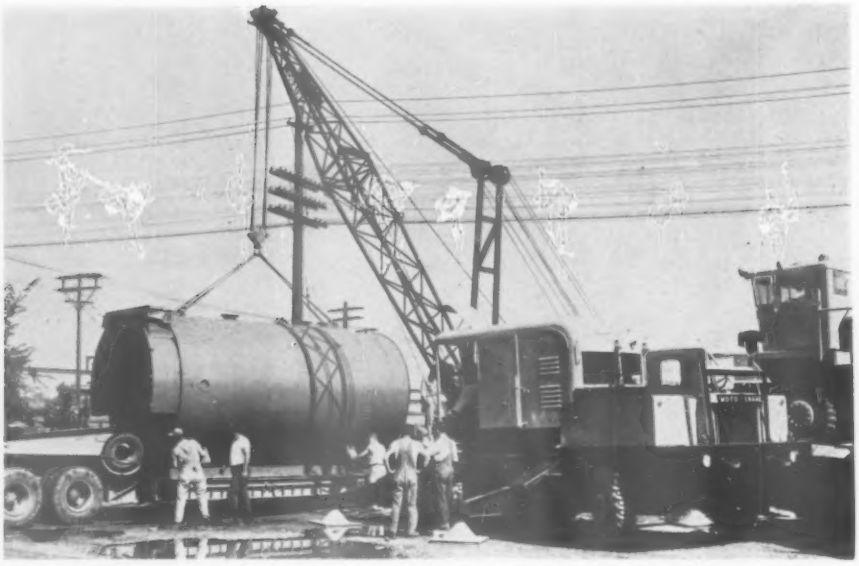
Fittings were then Tig (tungsten inert-gas) welded in place. The pure-nickel pipe was needed for transferring cargo and also for steam coils.

The *Marine Dow-Chem* was one of the first ships to use magnesium anodes attached to its hull as a means of preventing corrosion. These anodes, weighing 180 lb each, were held in place by large stud bolts position-welded on outer hull plates.

Inspection on the ship's exterior near the bow showed that stud bolts were still in good condition. The captain observed that this method of using anodes to protect continuously wetted hull surfaces appeared to be a success. He pointed out that only minor refinements were required by the *Dow-Chem*.

After 2½ years of the toughest service, the SS *Marine Dow-Chem* still possesses welds as strong and sound as the day they were made—undeniable proof of welding's dependability.

SEAM welds of caustic soda tanks give no evidence of corrosion, weld failure or fracture.



FINISHED unit in the field. This 30-ton-capacity "Moto-Crane" is loading a 55,000-lb boiler onto a low-boy trailer. Boom is 35 ft long.

Power crane booms improved through welding

By F. T. Tancula

WELDING has contributed much to the continuing betterment of the Thew Shovel Co.'s products, and a recent improvement is an all-welded square tubular boom for power cranes.

The Lorain, Ohio, firm's new design offers weight savings of 20 to 30% over equivalent angle-type or round tubular booms. Main benefit to the user: increased lifting capacity.

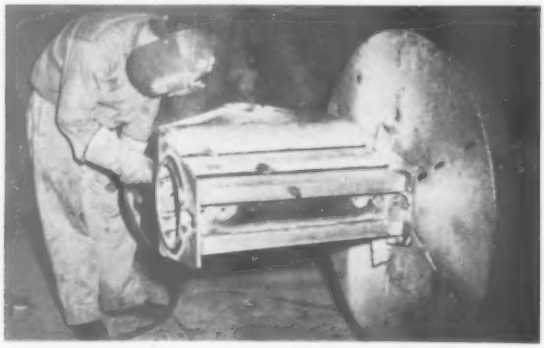
Main chords are square tubes, while lacing consists of continuous round tubes pre-formed to proper shape before being joined to the chords. Flat inner faces of the square chords provide good welding surfaces and eliminate the necessity of staggering the points at which lacing is welded to chords.

Section Lengths

These chords on smaller-capacity cranes (the complete line offers lifting capacities from 6 tons to 75 tons) are made of special carbon steel and are purchased in square tubular form. Basic and upper sections of smallest booms are 12½ ft. long. Intermediate booms have 15 or 20-ft. sections with 15-ft. tip sections; lower booms are made in 25-ft. sections.

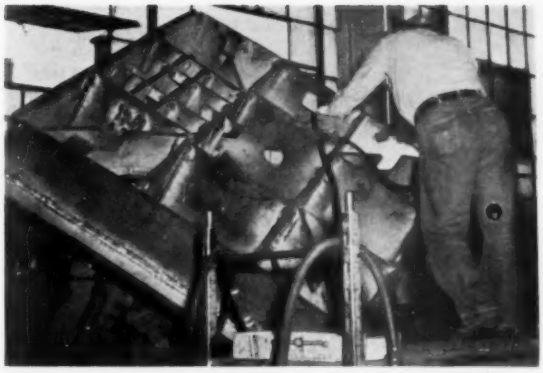
Center sections range from 5 to 20 ft. in length, in

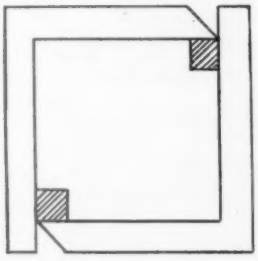
BOOM is tack welded with ⅛-in.-diameter E7016 electrode. Square chords are 4130 alloy steel, while tubular lacing is mild steel. Smaller-capacity booms are all carbon steel.



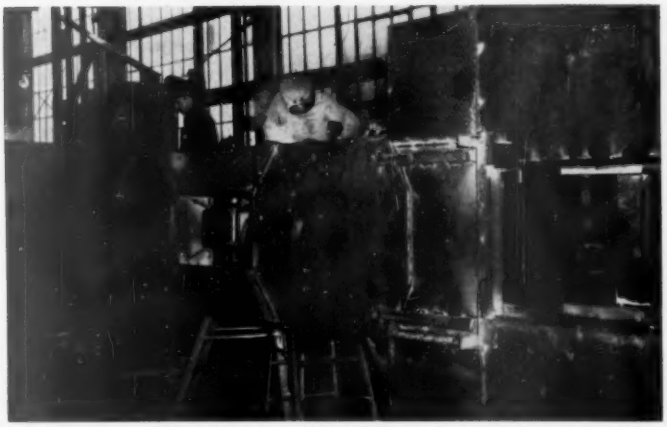
MAIN shipper shaft saddle, which is primary supporting frame and hinge assembly for the dipper stick, is welded with ¼-in. E6024 iron-powder electrodes. Power source is a-c transformer.

CRAWLER center for 2½-cu-yd power shovel or 60-ton crawler crane is welded with 5/16-in. E7016 low-hydrogen electrode with iron powder in its coating. Power source is again a-c transformer.





TWO T-1 steel angles, 8 by 8 by 1 in. thick, form box for dipper stick on large models. Back-up bar is mild steel, 1 in. square. One edge of each angle has 45-deg bevel.



CARRIER frame for "Moto-Crane 530" is positioned for welding stiffening gussets. This 30-ton-capacity, rubber-tired unit's frame is fabricated from plate thicknesses of ¾ to 1¼ in. Weldors here are using ¼-in. E6024 electrodes on a-c. Thew-Lorain uses current settings recommended by electrode manufacturer. Edge preparation is 45-deg single-vee bevel or 30 deg on each mating edge, depending upon plate thickness.

DIPPER stick for larger power shovels are fabricated from T-1 steel. Here weldor tacks two angles that form box frame. Finish welding will be done on submerged-arc welder in background. ***(See text for further details.)***

increments of 5 ft. When the jib extension is included, booms can run up to 180 ft. in length.

Main chords for larger capacity booms are extruded 4130 (a chrome-moly) steel. Wall thickness on various models ranges from 3/16 to 5/16 in. The carbon-steel chords are cold-rolled, formed, shaped into a box and seam welded by the resistance process.

Lacing material on all boom sizes is mild steel. When joining lacing to 4130, Thew-Lorain weldors use an E7016 electrode, reverse polarity. Diameters are ⅛, 5/32 and 3/16 in. Motor-generator welders provide power.

T-1 Dipper Sticks

In booms made entirely from mild steel, weldors tack with either E6011 or E6024 electrodes, and finish weld with the latter. Power for welding is derived from d-c motor-generator machines.

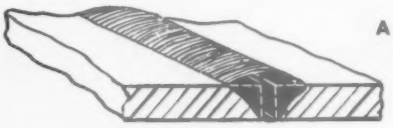
A special fixture and C-clamps *(see photo)* enable components of the boom to be laid out for tack welding, after which finish welding is performed while the assembly is rotated in a tail-and-headstock positioner.

Thew is justly proud of another recent design change . . . this one in basic material used for dipper sticks, which carry the dippers on power shovels. T-1 steel is now being used.

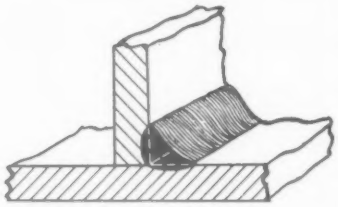
On smaller shovels, the dipper stick is an extruded box, 6 in. by 6 in., with a wall thickness of ½ in. It is welded to the 1030 steel hub stock of the bearing hinge with ¼-in. E7016 electrodes on a-c.

On larger models, the dipper stick is a welded box formed from two T-1 angles, 8 by 8 in. by 1 in. thick. A mild-steel back-up bar, 1 in. square, is tacked to each of the angles, and each angle has one edge beveled 45 deg *(see sketch)*.

After tacking angles together with E7016 electrodes on a-c, each seam is welded in two passes on an automatic submerged-arc welder. Power source here is a motor-generator machine, and the electrode is a 3/16-in. alloy steel wire. Welding speed is 12-14 ipm. These dipper sticks are fabricated in lengths of 18, 20, 24 and 27 ft.



A butt joint should be used wherever possible.



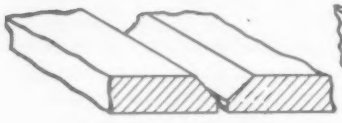
The fillet weld is extremely popular.

There is little resistance to bending in the lap joint unless a double lap weld (right) is used.

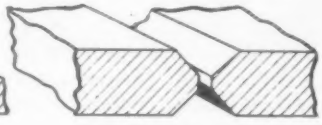
Flange joints are used on thin sheets.

Flange up to 1/8 in.

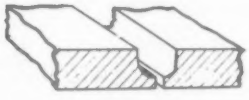
Square edge 1/8 to 3/16 in.



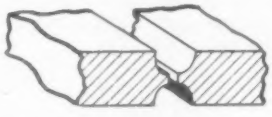
Bevel edge 3/16 to 5/8 in.



Double bevel over 5/8 in.



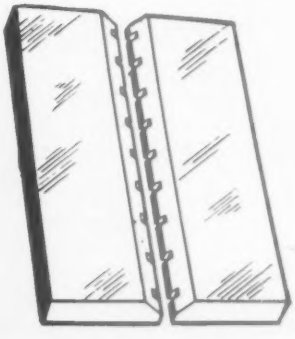
"U" Groove to 5/8 in.

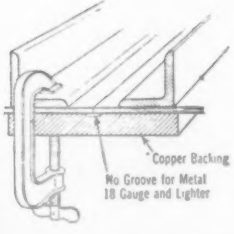


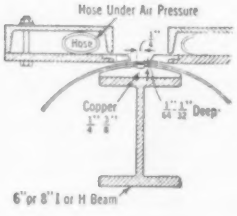
Double "U" Groove over 5/8 in.

Notching is a part of the edge preparation of the light metals, aluminum and magnesium.

Different steel plate thicknesses require different edge preparation.





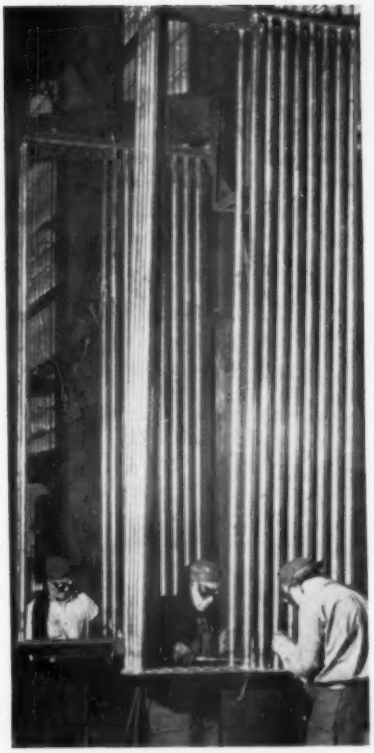


Jigs with back-up bars.

Jefferson's Gas Welding Manual forms the basis for this article on correct welding procedures to observe when using the oxyacetylene process. Other articles to follow soon in WELDING ENGINEER will describe proper pre- and postheat procedures; the importance of fixturing for welding; good flame-cutting practices, and other important aspects in the use of oxyacetylene equipment.

"How to do it" with an oxyacetylene torch

By T. B. Jefferson



SPEED and economy are prime factors in the almost universal acceptance of the oxyacetylene welding method. Thin sheets or heavy plates can be fabricated with the process, but certain procedural steps can never be omitted. Factors in this article, and in others to follow, must be given equal consideration by the weldor.

ANY METAL may be welded if proper technique and the correct welding process is used.

Certainly one of the correct processes for almost every metal type is the oxyacetylene welding method. This old friend will join all but a few metals—and the remainder are tricky materials that can best be welded with more highly-specialized processes.

The work which can be done with an oxyacetylene torch is limited, usually, by human errors rather than any lack of versatility in the process itself. Oversights and inconsistencies on the part of weldors, however, are not factors which must simply be taken into consideration in fixing operational costs.

Take An Interest

All of the seemingly minor details which even well-trained weldors forget to include in their work schedule *can* be re-learned in short order. Helpful—often vital—procedures can be placed in sequence and memorized by any weldor who takes a serious interest in both his profession and his job.

Placing first things first, and shooting for the mark of a good oxyacetylene weld, there is nothing more basic than cleanliness. No amount of emphasis on cleanliness in welding is excessive. The slightest dirt in any joint can cause incomplete welds, gas pockets, blowholes and slag inclusions.

Some defects resulting from dirt in a joint may seem unimportant, but there is no way of knowing when joint failure may touch off a critical situation. The weldor, then, should always strive for the perfect weld!

Oil and grease may be removed from base metal with a caustic soda and water solution, or with carbon tetrachloride. Gasoline is an excellent solvent, but fire danger forbids its use. With a minor flame adjustment, the oxyacetylene torch used for welding can also be used to remove oil, grease and paint.

Wire-Brushing

Shop dirt and light rust on base metal can be removed by chipping and wire-brushing. Heavy rust and scale should be removed by manual or mechanical chipping, flame-cleaning, or by grinding and wire-brushing.

Light metals, such as aluminum and magnesium, should be thoroughly cleaned with a chemical solvent (carbon tetrachloride), and joint edges should be filed or wire-brushed vigorously to remove oxides.

Weldors accustomed to welding steel often work slag out of a joint area *during* welding operations. This can be done when welding steel, but it is a bad habit.

Four Common Joints

Remember, you cannot depend on puddling impurities out of molten metal while brazing, braze-welding or hardfacing. Clean surfaces are extremely important in all welding operations. Be sure you are working with clean base metal.

Four types of joints are commonly used in oxyacetylene welding: butt,

fillet, lap and flange joints. There are variations, but basic joint types are depicted in this article.

Butt Joint: Most common and simplest of joint types, it is formed by butting plate edges. Butt welds should be made wherever possible, for they are the strongest weld joints when properly made. Manner of edge preparation for welding depends on plate thickness.

Fillet joint: This second most popular joint is formed by plates brought together approximately at right angles; the weld has a triangular cross-section. To obtain maximum strength in this joint, it is necessary to carry a wide weld pool. Cross-section of the pool must equal thickness of base metal at all points along the seam. Since such a wide weld pool is seldom used, fillets should be avoided whenever another joint type can be used.

Lap joint: Formed by overlapping plate edges, this joint has little resistance to bending stresses if a weld is made along one seam only. A double lap weld improves resistance, but consumes twice as much weld metal as does a butt joint.

Flange joint: The juxtaposition of flanged portions of two sheets form this joint. Filler metal is not required in welding since this joint is used only for thin sheets, 20 gage or less in thickness. Height of flange should equal sheet thickness; the weld is actually the melted flange. Penetration must be complete when welding this joint.

Joint Preparation

Type of weld joint to be made determines necessary joint preparation.

The manner in which joints are to be prepared for various thicknesses of low-carbon steel are also shown in the full page of sketches with this article. These suggestions work equally well for all weldable metals except aluminum and magnesium, which should also be notched.

For a flanged joint, the only preparation necessary is bending flanges along edges to be welded.

On square-edge butt joints, edges must be accurately matched for welding. If trimming is necessary, use an oxyacetylene torch or mechanical means. Be sure to clean off slag if the plate is flame-cut.

Bevel joints may be prepared by machining, chipping, grinding or flame-cutting—whichever is most convenient and economical. U-grooves may easily be made by flame-cutting, using a special cutting tip.

Tip Sizes for Welding Steel

Base Metal Thickness	Tip Drill Size No.*	Oxygen, psi	Acetylene, psi
24 ga. to $\frac{1}{16}$ in.	70	3-4	3-4
18 ga.–$\frac{1}{8}$ in.	62	4-5	4-5
$\frac{1}{8}$–$\frac{3}{16}$ in.	54	4-5	4-5
$\frac{3}{16}$–$\frac{3}{8}$ in.	48	5-6	5-7
$\frac{3}{8}$–$\frac{1}{2}$ in.	42	7-9	8-10
$\frac{1}{2}$–$\frac{3}{4}$ in.	37	7-9	8-10
$\frac{5}{8}$–1 in.	33	8-10	9-11
1 in. and up	29	9-11	10-12

**While this tip size is recommended, a size larger or smaller may be used by adjusting pressures of the welding gases.*

Welding Positions

All welds may be made in one or more of four common welding positions: flat or downhand, vertical, horizontal and overhead.

Steel is easily welded in any of these positions. This is true also of most other metals, though vertical and overhead positions pose serious problems with some metals.

Four factors play important parts in position welding; cohesiveness of weld metal, rod manipulation, flame force, and base and weld metal support.

Filler metal from a welding rod is generally added to every weld. For satisfactory results, filler metal must be similar in metallurgical and physical characteristics to base metals. Since commercial welding rods are made to definite specifications, they should be used in preference to "any old wire."

Welding Fluxes

Many metals which may readily be welded require flux to insure a good weld. Flux serves primarily to prevent oxidation, dissolves oxides, release trapped gases and slag, and to cleanse base metal during welding, soldering and brazing.

Flux may be applied in two ways: by dipping a heated welding rod in powdered flux, or by painting flux paste on welding rod and joint edges prior to welding. A paste is made by dissolving powdered flux in water or alcohol.

It is extremely important that flux be used in welding cast irons and most nonferrous metals. Upon completion of welds, remove all flux and slag.

It is important, also, that a proper size welding tip is used when joining any given thickness of metal. An undersized tip delays attainment of welding temperature in base metal; it may prevent welding. Use of an oversize tip may cause burning of base metal.

Recommendations of welding torch manufacturers regarding proper tip size should be closely followed. In the event such recommendations are unavailable, the table in this article gives tip size and balanced gas pressure to be used when welding various steel thicknesses.

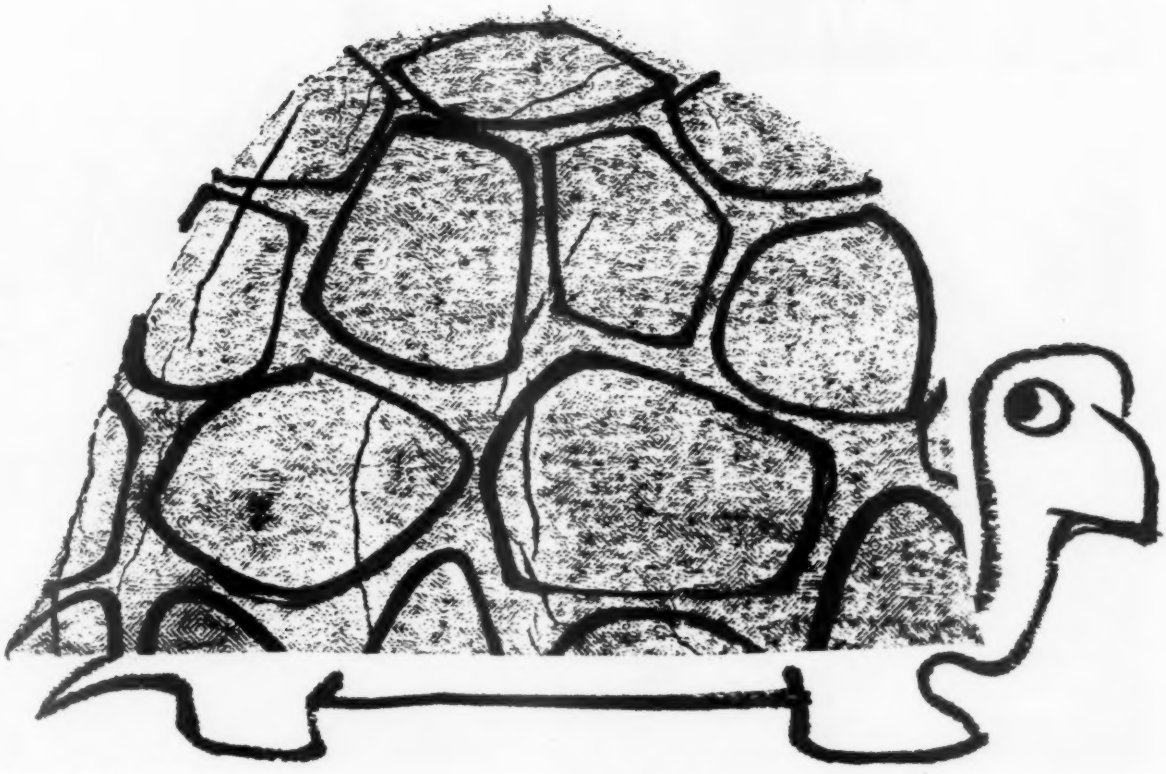
Flame Adjustment

An oxyacetylene flame may be one of three types: neutral, carburizing or oxidizing. The neutral flame is generally preferred.

Neutral flame: Produced by burning a correct mixture of oxygen and acetylene, this flame has a clear, well-defined white cone. Welds made with a neutral flame should be thoroughly fused and free of burned metal or hard spots.

Carburizing flame: Created by burning an excess of acetylene, this flame introduces carbon into a weld and may readily be recognized by a feathery edge on the white cone. Some metals are welded with a carburizing flame because of desired carbon addition.

Oxidizing flame: A shorter envelope and a small, pointed white cone identifies the oxidizing flame with its excess of oxygen. This flame causes oxidation or burning of weld metal.



TAKE A TIP FROM THE TORTOISE

Built like a battleship without a wasted ounce of material, he's the living proof that basic design, craftsmanship and skillful engineering pay off through many years of hard usage.

Thousands of welding engineers feel the same way about Norris-Thermador Acetylene Cylinders. Norris-Thermador's exclusive cold-drawn construction makes a shell that is handy, rugged and enduring. Four selective filler components (charcoal, cement, asbestos and diatomaceous earth) provide a precisely-balanced filler for greater gas capacity and long-lasting performance.

So that's the tip from the tortoise — solid profits for you!

Write or wire for specifications, sizes and prices.
Cable NORTHERM.

3-1103

"SEVEN LEAGUES AHEAD"

NORRIS-THERMADOR CORPORATION

5215 SO. BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA, DEPT. WE-157

Allis-Chalmers and A. O. Smith cooperate . . .

Develop Semi-Universal difficult welds

Cylindrical construction of the tubular frame provides greater resistance to twisting. It's an Allis-Chalmers exclusive.

Here's how A. O. Smith's welding experience and research facilities helped Allis-Chalmers get the right electrode (SW-29) to end a complicated welding problem

• When a motor grader goes to work, its forward frame absorbs terrific shocks and stresses. To minimize this effect, make their motor grader even better, Allis-Chalmers brought forth a daring departure in design—the tubular frame. Performance-wise, it proved its superiority. Its success, however, was dependent on consistent high quality welds, made under very difficult conditions.

To make these difficult welds on the tubular frame along with the majority of the welds on the entire motor grader, Allis-Chalmers needed an E-6012 electrode that would perform equally well on many gauges of metals, be easy to use out-of-position, and have a high degree of welder acceptance.

So Allis-Chalmers called in A. O. Smith and asked, *"Could A. O. Smith work with them to develop a Semi-Universal E-6012 — a rod equally good for both light and heavy gauge metal . . . that would have little spatter and be easy to use."*

In traveling and working over rough terrain like this, the Allis-Chalmers FORTY FIVE Motor Grader subjects most welds to repeated shocks and heavy torsional stresses. To protect the machine's performance, A. O. Smith welding electrodes are used.

E-6012 Electrode for on new motor grader

After intensive research, experimentation and close cooperation with Allis-Chalmers — A. O. Smith came up with the SW-29. It met all qualifications.

Since that time, reports Allis-Chalmers, motor grader welding production has been "highly satisfactory" . . . that A. O. Smith electrodes helped solve the bulk of their electrode ordering and stocking problems.

What's your welding problem? Big or small, A. O. Smith is anxious to know what problems you're encountering . . . make A. O. Smith's unexcelled experience and facilities available to help you eliminate them. Also, there's the A. O. Smith Welding Institute—a two weeks' advanced course in the latest welding theory, practice and equipment. It's open to welding engineers and top welding foremen in every industry. Why not contact your "man from A. O. Smith" now for the complete story?

The man from A. O. Smith —

Hal Costello is the A. O. Smith welding consultant who worked with Allis-Chalmers. More than a salesman, he's a welding specialist, ready and eager to help with any welding problems.

Through research A.O. Smith *. . . a better way*

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: MILWAUKEE 1, WISCONSIN

Bureau of Mines' 1955 survey reveals . . .

Mig and Tig take 64% bite in private helium supply

"OF helium used in Mig and Tig welding, about 60% is used on stainless weldments. . ."

By a Staff Member

A STATISTICAL BULGE indicating welding's increased helium usage —and a warning to use the gas sparingly in the next 12 months to avert a shortage—were principal points of interest in the Bureau of Mines' 1955 helium survey.

Inert-gas-shielded welding processes took a 64.5% (45,472,500 cu ft) bite out of the 70,500,000 cu ft of helium allotted to private customers. The Bureau of Mines, sole U. S. producer of helium, shipped 235,000,000 cu ft in 1955 (45 million more than in 1954)—and 70% of it went to Federal agencies.

Used on Stainless

The helium segment of the Interior Department's mineral industry survey was addressed to 1,000 private firms. Over 800 questionnaires were returned, representing usage figures on about 75% of private helium shipments.

Approximately 60% of helium used in Mig and Tig welding (or about 27.3 million cu ft) is employed in stainless steel fabrications. Survey respondents indicated that argon could not be substituted for helium in many applications without sacrificing output and quality.

Argon and helium are equally inert, but other physical properties of density, heat conductivity and electrical characteristics differ markedly.

Other usage areas noted in the Bureau survey: leak detection, 8.5% (5,992,500 cu ft); titanium production and fabrication, 7.5% (5,287,500 cu ft). Research, controlled atmospheres, medical applications and transistors were among other measurable use areas.

Worthy of note is the fact that slightly less than 500,000 cu ft of helium were used for advertising purposes and for toy balloons; lighter-than-air craft consumed a similar amount.

Amount of helium used for research (slightly less than 3.6 million cu ft) includes that used in researching all other survey categories, as well as in research in the fields of cryogenics, serodynamics and electronics. The usage figure is higher than anticipated.

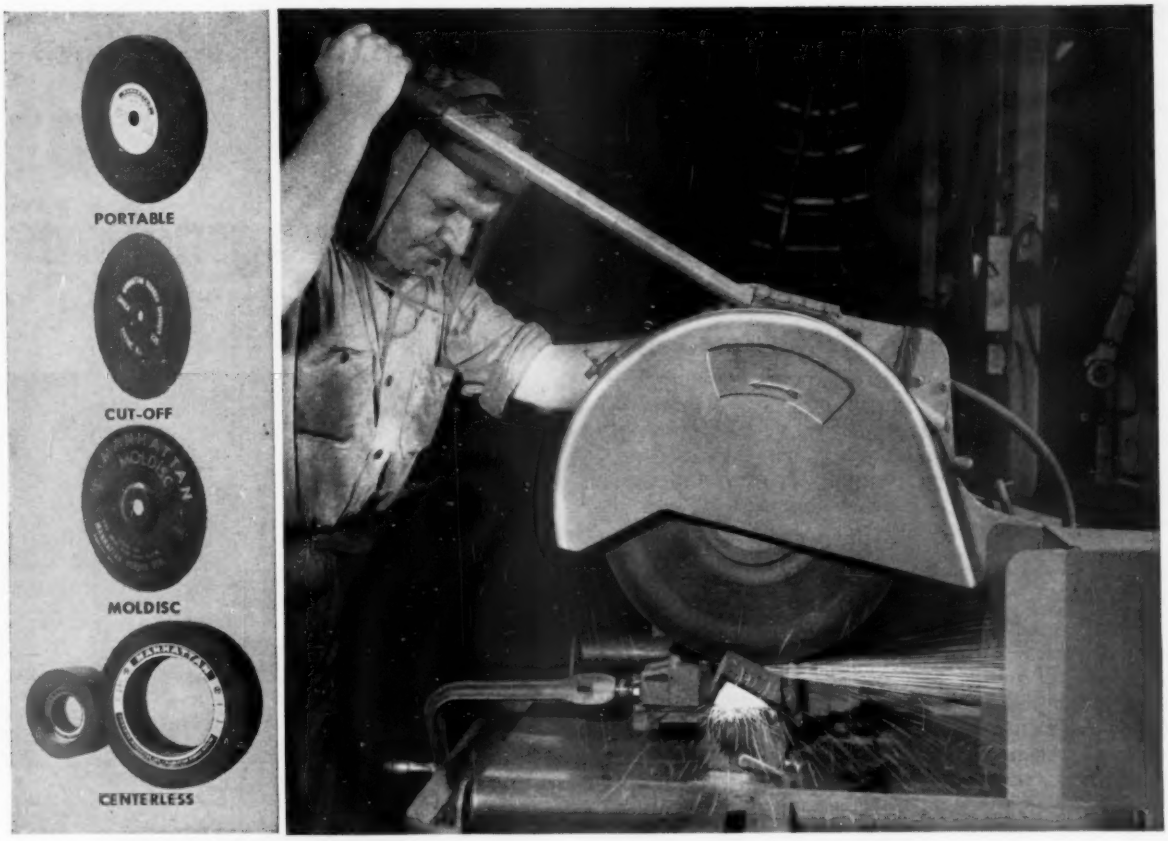
Leading State Users

With California well in the lead, a nine-state grouping constitutes principal helium users by geographic area. Together, these states account for over 95% of private helium utilization. The chart below breaks down this figure.

California	30.6%
Connecticut	19.6
New Jersey	12.9
Illinois	7.5
Ohio	6.7
Massachusetts	6.5
New York	4.4
Wisconsin	3.7
Indiana	3.3
All other states	4.8
Total	100.0%

Under existing legislation, the Bureau of Mines is responsible for production, conservation and transportation of helium for Federal and private needs. Additional facilities at the Bureau's Exell, Tex., plant are now under construction to provide a substantial increase in helium-production capacity.

This work will not be completed until April or May, 1957, however, and interim supplies will be tight. The Bureau, therefore, has again recommended that helium be used only where it offers definite technical advantages. User conformance with this request is necessary if a critical shortage is to be averted, the Bureau stated.



"More Use per Dollar" With MANHATTAN CUT-OFF WHEELS

In factories where records are kept, Manhattan Cut-Off Wheels have proved they do a better, cleaner cutting job . . . and last longer than any other wheels! Exclusive Manhattan developments in both rubber and resinoid bonds account for this greater cutting efficiency and longer service life. Every Manhattan wheel is custom-bonded for your specific cut-off job . . . to give you cleaner, cooler cutting at higher machine speeds whether you work with hardened or soft steels, light gauge tubing or critical alloys. Safe, fast, clean cutting over sustained periods of time saves you time *and* money . . . improves quality of production.

Manhattan Cut-Off Wheels are made to your order in the widest range of types and sizes. Manhattan Portable Wheels, Moldiscs, and Centerless Wheels are also custom-made for specific operations at your plant. Let a Manhattan Abrasive Wheel engineer show you how you can save time and money . . . get "More Use per Dollar" . . . with Manhattan Cut-Off Wheels and other types of high speed, heavy duty abrasive wheels.

RM742

GRINDING WHEEL INSTITUTE MEMBER

WRITE TO THE ABRASIVE WHEEL DEPARTMENT

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Belts • Hose • Roll Covering • Tank Linings • Industrial Rubber Specialties • Abrasive and Diamond Wheels • Brake Blocks and Linings • Clutch Facings • Asbestos Textiles • Mechanical Packings • Engineered Plastics • Sintered Metal Products • Industrial Adhesives • Laundry Pads and Covers • Bowling Balls

offers a line of —the right packaging—the

In ever-increasing numbers, users of welding wire are looking to PAGE for their wire needs. The one biggest reason is that they have found that PAGE—in a unique degree—has the *facilities, experience* and *special skills* to draw and furnish exactly the right wire for your welding jobs. And behind that lies a story.

All Processes Closely Controlled

PAGE is *the one supplier* of welding wire who is in a perfect position to control the chemical and physical properties of its products all the way from billet to rod to finished wire. That is because we purchase our raw materials to rigid specifications; we select heats of carbon, low alloy and stainless steels for certain optimum characteristics—then, upon delivery to the mill, we analyze representative samples for compliance with PAGE specifications.

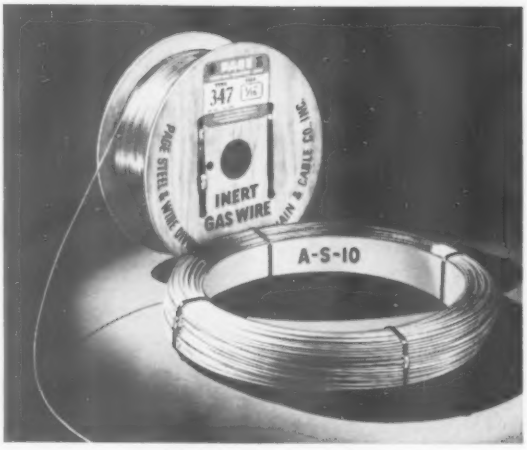
These purchasing and testing practices permit the production of wire capable of depositing weld metal which complies absolutely with welding requirements. *You don't have to compromise* when you buy, specify or use welding wire by PAGE!

Page Meets Today's Needs

One example of PAGE'S facilities for furnishing a wide range of quality-controlled welding wires for modern applications is shown by our stainless steel automatic welding wire. To meet needs of recent developments in the field of inert gas welding, PAGE offers fine wires (.020″ to .09375″) for use in semi-automatic arc welding machines in which the arc is shielded with argon, helium or CO_2 inert gas. These wires, wound on non-returnable plywood reels, furnish the utmost in convenience and freedom of wire feed.

Wire for All Types of Welding

You will find many advantages in standardizing on PAGE welding wire for your needs—whether for automatic or manual use . . . arc or gas welding of all types. Not only does PAGE offer a wide range of analyses, as shown in the column at the right, but we have unsurpassed facilities for manufacturing wire to any desired size, temper or surface finish—and can furnish it promptly, in many methods of packaging, through the convenient nation-wide PAGE Distributor service.



The Right Wire— Wide Analysis Range

There are *26 different analyses* in the PAGE line. These cover the field of applications: heavy automatic submerged arc...light manual submerged . . . inert gas manual . . . automatic, tungsten or metal arc.

AUTOMATIC WELDING WIRE

CARBON STEEL...Any carbon from Armco (.025 max.) to high carbon (.90-1.10)

LOW ALLOYS...All the most popular welding grades.

STAINLESS...All standard AISI grades. Other types on request.

GAS WELDING RODS

Since 1914, the standard of quality, uniformity and satisfactory performance. PAGE offers an exceptionally wide range of rods—furnished in 36-inch lengths, in coils or on reels in the following materials: Mild Steel • Armco • Low Alloy • Carbon Steel • Stainless Steel • Manganese Bronze • Naval Bronze

BARE ELECTRODES

PAGE Bare Electrodes are supplied in any carbon from Armco to high (.90-1.10) carbon.

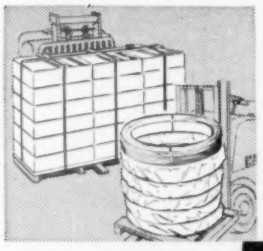
METAL SPRAY WIRE

Furnished as follows: Any carbon from Armco to 1.00 carbon • Low Alloy • Stainless Steel • Manganese Bronze • Naval Bronze

the right welding wires
right service—for modern needs

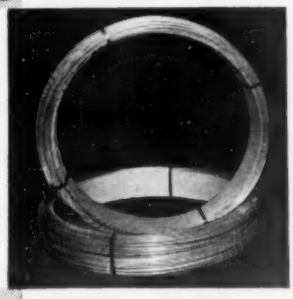
PAGE WIRES ARE PACKAGED RIGHT

PAGE Welding Wires are packaged in a wide variety of ways for the most complete protection and the utmost convenience in handling, in stocking and in use.



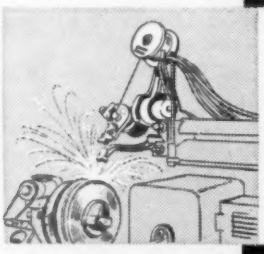
Wrapped Coils and Coils in Cartons

Single and palletized coils, each coil steel-strapped and wrapped in waterproofed paper. ...Also, coils in individual cartons, singly or palletized.



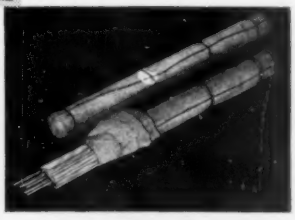
Welding Wire in Coils

PAGE A-S Automatic Welding Wire is regularly furnished in layer wound coils with cardboard liner, four Signode straps to facilitate coiling and easy unwinding.



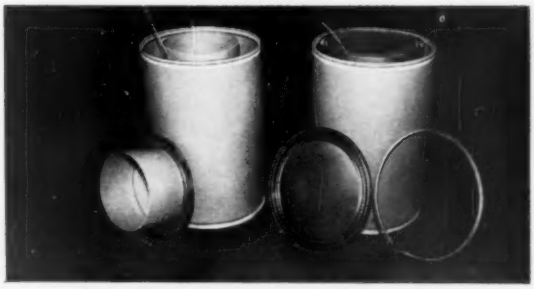
Handy Reels

PAGE Inert Gas Welding Wire is available on reels: Precision thread-wound on twenty-five-pound, non-returnable reels to fit all popular inert gas welding machines.



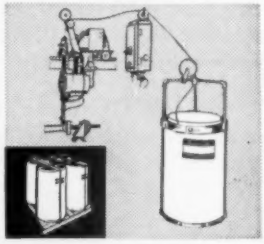
Gas Rod Packing

Gas welding rods are packed in 36″ lengths in 50-lb. bundles—paper and burlap wrapped. Also in coils and reels (approx. 150 lbs.)—burlap wrapped. Stainless rods also come in 10-lb. fibreboard cartons.



LEFT: Pay-off-pak ready for filling, with "wire slinger" for uncoiling at extreme left. RIGHT: "Wire slinger" installed for feeding out wire; also, below, re-usable lid and retaining ring. Ring insures smooth feed-out of wire without snarls or kinks.

Sketch at right shows Pay-off-pak for continuous feeding up to 500 lbs. of wire without rethreading. Also (inset) lightweight Leverpaks. Both these containers protect against coil distortion... are easily opened, resealed, handled, stored.



PAGE Service Means Prompt Delivery From Local Stocks

You can get PAGE automatic arc welding wire, or oxy-acetylene welding rods quickly and easily from your nearby PAGE Distributor.

PAGE Distributors carry ample stocks from which your requirements can be filled without delay or inconvenience to you. This handy service not only saves you time in getting what you need, but makes it unnecessary for you to make a sizeable investment in inventory.

Send For These

Folder **DH-402A**—PAGE Submerged Arc and Inert Gas Welding Wire.

Booklet **DH-1277**—PAGE Gas Welding Rods.

Write our Monessen, Pa., office for *either or both*

ACCO products

ACCO

TRADE MARK

Page Steel and Wire Division
AMERICAN CHAIN & CABLE

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

Better Value

Submerged-arc had disadvantages here. Now, by tooling-up for a new process . . .

Kelvinator gets better welds with CO_2 Mig

A RECENT switch by Kelvinator of Detroit, Mich., from submerged-arc to Mig welding with CO_2 shield has given promised results. But it wasn't made without first overcoming a serious problem.

A division of American Motors Corp., Kelvinator decided to make the change while tooling up for production of a new, hermetically-sealed compressor for household refrigerators. Compressors, designed for a dust-free service life, had to be sealed in a way that kept dirt from re-entering spotless interiors.

Spreading Flanges

Automatic submerged-arc welds joining cover plates to shells spread flanges of earlier compressor models until the new type was introduced. A reverse lip flange ended the trouble, but Kelvinator engineers felt that better oxidation protection could be gained from inert-gas-shielded welds.

Carbon dioxide was chosen as a shielding gas. In trial runs it performed well, but in production it developed a spatter problem. Spatter gathered on the gas nozzle and dropped onto the weld joint ahead of the arc.

Wherever spatter dropped onto the joint, a leak generally developed. Spatter remaining on the gas nozzle eventually clogged it and caused uneven distribution of gas shield.

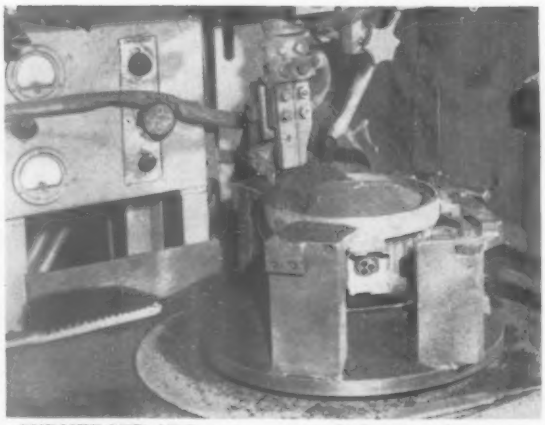
Even the remedy of a shortened arc failed to solve Kelvinator's problem. So the solution was sought in a gas-feed method that used other equipment. A copper tube, run down the side of the welding head to the wire, now discharges all shielding gas.

Reduced Adherence

Position of this tube is out of the direct spatter area, but close enough to the arc to provide good gas coverage. Engineers note that copper's high heat conductivity reduces spatter adherence to some extent.

The automatic Mig application joins approximately 100 units per hour. The welding machine operator receives compressor components on an assembly line, and places them on a fork which carries them into the welding machines.

Welding heads are stationary; after a protective cover slides over the workpiece, compressor shells and covers rotate 360 deg under the arc for a complete seam weld. Production rate with the submerged-arc method was 55 units per hour.



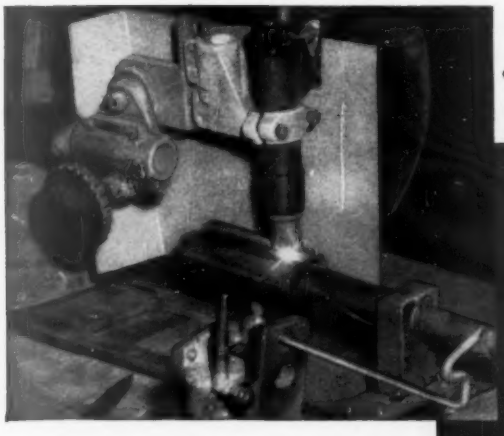
SUBMERGED-ARC process spread flanges when joining cover plates to compressor shells. Also, carbon flux did not afford oxidation protection of CO_2 gas.

PROTECTIVE cover slides over workpiece during circumferential Mig weld. Fixture rotates part under stationary welding head.

ASSEMBLY line now carries compressor components to automatic Mig unit at double the rate handled by submerged-arc machine.

GAIN NEW SPEED AND WELD QUALITY

in light-gage metal fabricating



HELIARC welding has increased both the production speed and weld quality of these stainless steel parts.

Throughout industry, from production line operations to one-of-a-kind jobbing, HELIARC argon gas-shielded welding is helping fabricators gain new top weld-quality and production speed. These typical pictures show how HELIARC welding is used to efficiently fabricate sections of the Cory "Crown Jewel" percolator.

SETUPS DESIGNED TO FIT JOB NEEDS

These .031 in. type 302 stainless steel parts are fabricated in two fast, efficient operations. A mechanized HELIARC torch is used to butt weld a seam in the percolator's spout —and a stationary HELIARC torch welds the bottom section to the unit's body while parts rotate.

WELDING IS FAST, WELDS ARE SOUND

It takes only a few seconds to complete a 4½-in. long butt weld in the percolator spout. In the second HELIARC welding setup, a 17-in. circumferential weld on the percolator bottom is completed in only a fraction of a minute.

WIDE RANGE OF EQUIPMENT AND APPLICATIONS

HELIARC welding setups are available for manual, semi-automatic, and automatic operations. All are ideal for a wide range of light-gage metal jobs. Call your local LINDE representative and find out which HELIARC welding apparatus is best suited for your fabricating needs. Start saving now—call today.

Linde Air Products Company

A Division of Union Carbide and Carbon Corporation

30 East 42nd Street UCC New York 17, N. Y.

Offices in Other Principal Cities

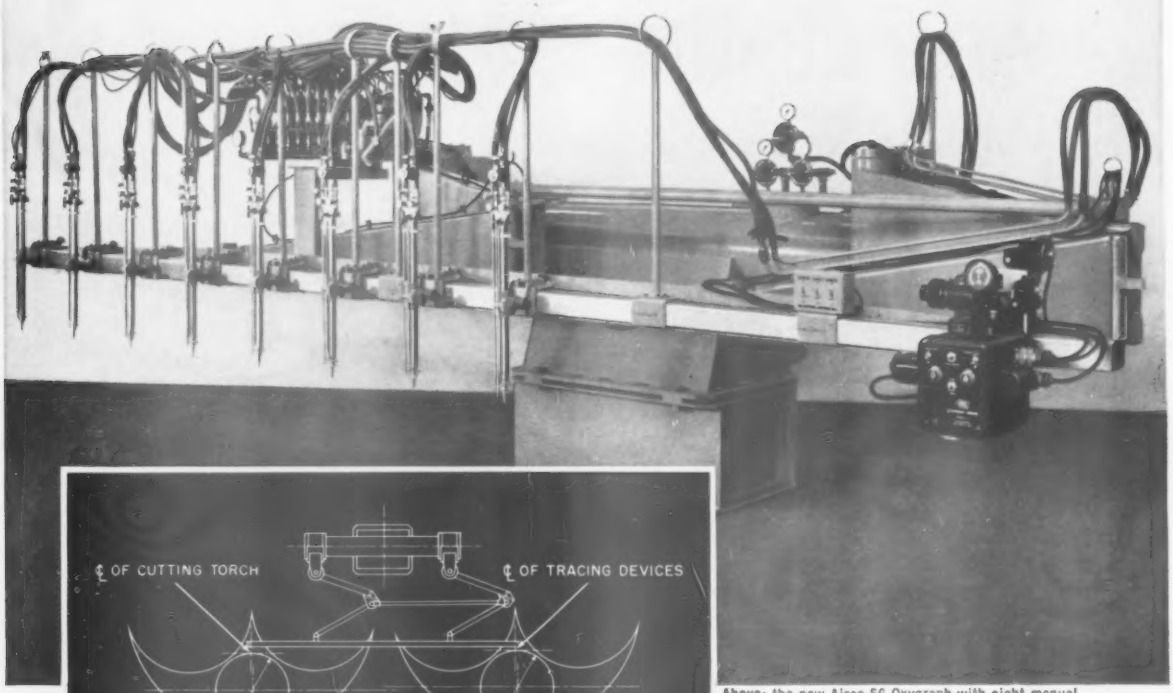
In Canada: LINDE AIR PRODUCTS COMPANY

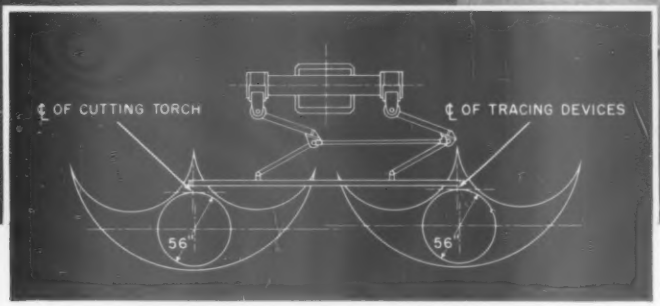
Division of Union Carbide Canada Limited, Toronto

"Heliarc" and "Linde" are registered trade-marks of Union Carbide and Carbon Corporation.

Linde Trade-Mark

...for better machine gas cutting





Above: the new Airco 56 Oxygraph with eight manual torches. All-welded construction provides unusual sturdiness and durability.

At left: drawing shows great versatility in patterns that can be cut with the new model 56.

NEW...Airco 56 Oxygraph

...for better machine gas cutting of larger work on production schedules

This newly developed Airco 56 Oxygraph meets the demand for a multi-torch oxy-acetylene shape cutting machine that will handle substantially large areas. It *cuts* a *full 56" circle*, and corresponding square and rectangular shapes. Rugged box girder design is used for the pantograph arms, holding vibration to a minimum. Tracer response is smooth and friction-free as a result of large diameter ball bearings in the pantograph hinges and operating bar assembly.

This newest of Airco Oxygraphs will cut an unlimited variety of shapes from steel plates, slabs, billets and forgings. Flexibility of design allows amplifying scope of machine to meet increased shop demands. Tracers are available in four types: electronic, manual, magnetic and spindle. This widened capacity of the new model 56 marks another step forward in welding and cutting progress. For detailed information on the New 56 Oxygraph, write direct to Airco.

AT THE FRONTIERS OF welding PROGRESS YOU'LL FIND . . .

AIRCO®

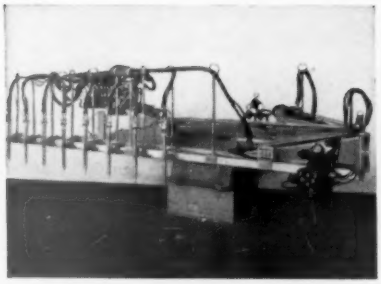
Offices and dealers in most principal cities

AIR REDUCTION SALES COMPANY

A division of Air Reduction Company, Incorporated
150 East 42nd Street, New York 17, N. Y.

On the west coast — Air Reduction Pacific Company
Internationally — Airco Company International
In Cuba — Cuban Air Products Corporation
In Canada — Air Reduction Canada Limited

Products of the divisions of Air Reduction Company, Incorporated, include: **AIRCO** — industrial gases, welding and cutting equipment, and acetylenic chemicals • **PURECO** — carbon dioxide, liquid-solid ("DRY-ICE") • **OHIO** — medical gases and hospital equipment • **NATIONAL CARBIDE** — pipeline acetylene and calcium carbide • **COLTON** — polyvinyl acetates, alcohols, and other synthetic resins.



this brand new
Model 56
OXYGRAPH

has these exceptional advantages

Cuts a full 56" circle, and corresponding square and rectangular shapes

•

All-welded steel construction for lasting durability

•

Box-girder design of pantograph arms assures efficient operation even with maximum loading of operating bar

•

Reinforced operating bar provides for mounting of torch holders, torches, tracing devices and electrical control equipment

•

Centralized gas control of torches with electrical solenoid valves allows operator to turn on, light and shut off gases without leaving tracing table

•

A maximum of 8 torches can be used, with manual or motorized torch holders

•

A cutting-oxygen ease-on valve, supplied with the machine, is invaluable in making piercing starts

You'll find the new AIRCO 56 Oxygraph a substantial production help in metal shape cutting. For complete details

write direct to

AIRCO

SEMIAUTOMATIC welder feeds coiled wire through cable to welding nozzle. Shovel truck pads are being rebuilt.

Semiautomatic hardfacing comes of age

INCREASED speed and economy are benefits said to result from application of a semiautomatic hardfacing method developed by Stoody Co., Whittier, Calif.

The method finds its greatest use in maintenance of such equipment as shovel pads, bucket teeth, lips and runners, dredge parts, tampers, pump shells and impellers, crushers of all types, conveyor screws, dozer blades, end bits and tool joints.

These and other parts have, until recently, been commonly rebuilt and hardfaced manually.

Small-Diameter Wires

The semiautomatic welding machine is essentially a simple device to feed continuous coiled wire through a flexible cable to the welding nozzle.

Wires of small diameter are used, and are said to deposit weld metal at a greatly increased rate over larger wires at any given amperage. All standard semiautomatic welders can be easily and inexpensively converted to use of small-diameter wires, the manufacturer states.

The method provides for a number of different analyses designed for all types of buildup and hardfacing applications—from simple buildup of manganese parts to deposition of tungsten-carbide overlays.

High Deposition Rates

The process is said to offer the following advantages: open arc welding with no flux; deposition rates as high as 20 lb per hour; no stub end losses, and no time wasted changing electrodes.

Other advantages claimed include lightweight equipment which is easier to handle; complete visibility of the arc, and hardfacing and buildup wires for every purpose.

HARDFACING method finds greatest use in maintenance of such equipment as clamshell buckets.

More on oxygen . . .

Wide market seen for liquid cylinders

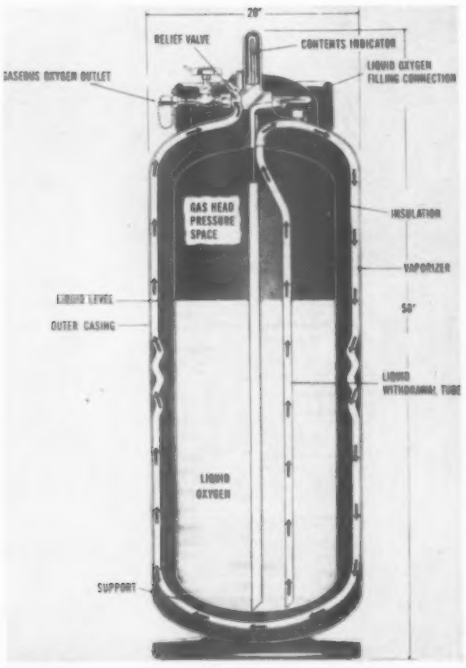


DIAGRAM indicates how Linde's new liquid cylinder operates. Cambridge's has vaporizer coils at top of tank.

By F. T. Tancula

ANOTHER PHASE of the oxygen battle begins to take shape.

Manufacturers of oxygen equipment are pushing new products into the *distribution* field. Always highly competitive, the oxygen industry is becoming even more so with the ever-widening scope of its applications. (*See* "Oxygen . . . its past, present and future," WELDING ENGINEER, *Nov., p. 44.*)

Two of the newest "new products" in the distribution field are the brain children of Linde Air Products Co. and Cambridge Corp. The latter took advantage of a recent Chicago meeting of IOMA (Independent Oxygen Manufacturers' Association) to introduce to prospective customers the "Loxette 3000." It is a liquid oxygen cylinder holding the equivalent of 3,000 cu ft of gaseous oxygen.

Linde's counterpart (actually introduced earlier last year) is the "LC-3," which is of the same capacity. A single unit supplies the normal capacity of 12 "K" type gas cylinders.

Eliminate Cylinder Handling

These cylinders are looked upon as a logical end to efforts aimed at furthering transportability advantages of liquid oxygen—bringing the economies right down to the ultimate consumer. They represent a new concept in liquid oxygen distribution.

There is a definite need for more economical means of shipping and storing oxygen. Cylinders of this type are not necessarily the final answer to such problems. But they certainly are steps in the right direction, and there should be a wide market for them.

Linde's "LC-3" weighs about 505 lb when full, and this is little more than one-quarter the weight of its storage equivalent of 12 "K" high-pressure cylinders. Like the competitive Cambridge cylinder, an "LC-3" is likely to find greatest acceptance among users who consume more than 5,000 cu ft of cylinder oxygen at any one point. It delivers 300 cfh at 75 psi.

Can Be Manifolded

Depending upon customer needs, both tanks can be used alone or in manifold with identical units. The Cambridge liquid cylinder has a basic delivery rate of 150 cfh, with delivery pressure variable from 50 to 200 psi. It has a removable vaporizer atop the tank which can be interchanged with vaporizers of different capacity.

The Linde cylinder's vaporizer is not removable . . . it is contained within the walls of the tank (*see sketch*).

Both storage units are easily handled by one man through use of a hand truck. Each weighs about 300 lb when empty.

Getting the jump on their rivals in this distribution to the small user may put Linde and Cambridge ahead in the race. But their rivals are not exactly asleep.

Because Cambridge is not a gas producer, all of its equipment must be sold to competitors of Linde—be they members of IOMA or the larger producers. Whether Linde ever decides to sell the "LC-3" remains for

choose CRUCIBLE STAINLESS

AUTOMATIC WELDING WIRE

for

1. widest range of analyses
2. fast delivery from local stocks
3. packaging to fit your needs
4. Crucible special steel quality

Crucible stainless automatic welding wire gives faster, cleaner, sounder welds – saves you time and money. And it's backed by a half century of *special steel-making.*

At your local Crucible warehouse, automatic welding wire is promptly available in most stainless steel grades . . . in spools, coils or cut lengths to fit your exact requirements.

So next time you need welding wire – or help with a welding problem – call Crucible. *Crucible Steel Company of America, The Oliver Building, Mellon Square, Pittsburgh 22, Pa.*

CRUCIBLE first name in special purpose steels

Crucible Steel Company of America

Canadian Distributor — Railway & Power Engineering Corp., Ltd.

the future to answer. But as of now they will be leased only, and thus become a regular link in Linde's distribution chain.

Hence, it is not improbable that "Loxette" cylinders (or similar units of different manufacture should they become available) might find their way into distribution set-ups of other large gas producers.

Some Won't Talk

Many of these producers were reticent when asked point-blank, "Are you going to introduce similar equipment?"

National Cylinder Gas Co. preferred to say "nothing at this time," which leads to further speculation that it *is* investigating and testing marketable cylinders and designs of its own.

The research laboratory of Air Reduction Sales Co. is presently occupied with similar tasks. Airco's distribution organization will find itself expanding as the direct result of increased production.

Two new production plants will begin deliveries sometime in 1957. One, in Chicago, will have a daily capacity of 75 tons of high-purity products—55 tons of liquid oxygen, about 15 tons of liquid nitrogen, the remainder liquid argon. The other is in the Los Angeles area and will have about the same daily capacity.

LIQUID oxygen is delivered by tank truck to this unit situated on welding distributor's grounds. Stored as liquid, the oxygen can be taken off as gas or liquid.

CAMBRIDGE cylinder holds liquid equivalent of 3,000 cu ft gaseous oxygen. Basic delivery rate is 150 cfh, and delivery pressure may be varied from 50 to 200 psi. Vaporizer at top of tank is removable and interchangeable.

Like other firms in the field, Airco has long had trailer trucks, customer stations, etc., for delivering and storing liquid oxygen. But a liquid container for the smaller user is not presently among these resources.

Research Goes On

The Liquid Carbonic Corp. has just completed "an intensive market research program to determine future demands and distribution requirements for all industrial gases." The firm asserts that equipment for manufacturing, distributing and storing the gases and their liquid counterparts is now on order and is expected in service by fall

No specific mention, however, of the exact *type* of equipment.

Air Products, Inc., feels the generators it supplies on a lease basis to what it calls the "medium-size user" are competitive with cylinder oxygen . . . which seems to imply that they are not thinking of entering the field with a liquid container like those of Linde and Cambridge.

Nevertheless, Air Products is also in the cylinder-gas business so nothing should be taken for granted.

Still to be heard from are Independent Engineering Co., Inc., and Superior Air Products. Both manufacture generating equipment of all sizes and are also in the distribution equipment field. And there is always the possibility of smaller, lesser-known firms entering this growing market.

Distributor and Liquid

Another phase of expanding oxygen distribution facilities was begun by Linde in September, with installation of a 150,000-cu ft, vacuum-insulated storage unit on the property of a welding supply distributor—Mittler Supply, Inc., South Bend, Ind.

The new liquid oxygen unit comprises a tank, evacuation pump, immersion pump, vaporizer and filling rack.

Tank trucks from Linde's East Chicago (Ind.) plant supply the unit, which is operated by Mittler personnel. Both high-pressure and liquid oxygen cylinders, like the "LC-3," can be filled from this storage installation.

Linde anticipates that this is but the first of many such installations with their distributors, particularly in locations removed from cities in which they have oxygen-producing plants.

The Mittler facility is the first instance in which a distributor has had an opportunity to handle bulk oxygen in liquid form.

NEW!

TUBE-TURN* "TAPER FACE" FLANGE

...cuts cost of light-duty piping

...protects low pressure pumps and valves

Tube Turns announces a new lightweight welding neck flange for service up to 125 lbs. W.O.G. pressure, offering two important cost-cutting advantages: (1) It is priced lower than conventional flanges. (2) This lightweight welding neck flange has a tapered face which affords an effective seal with reduced bolt loading; hence, permits use of steel butt welding neck flanges without danger of cracking the flat faced cast iron flanges of valves and pumps used in low pressure piping systems. Here is another result of Tube Turns pioneering research, and an example of how you get *more for your money* when you specify TUBE-TURN Welding Fittings and Flanges and buy them from your nearby Tube Turns' Distributor.

tt
TUBE-TURN
TRADE MARKS

*"TUBE-TURN" and "tt" Reg. U. S. Pat. Off.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS LOUISVILLE 1, KENTUCKY

A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver
Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

HOW TO SAVE

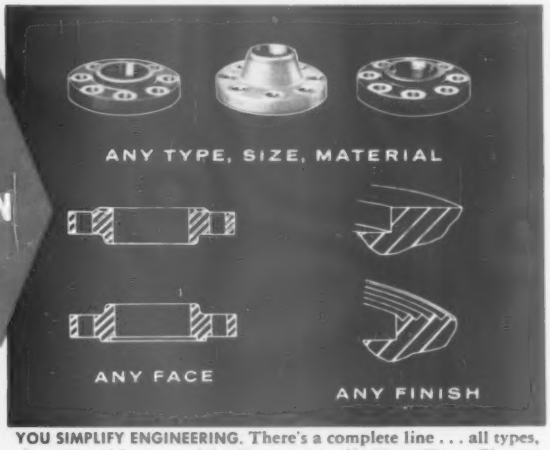
How you cut costs with
TUBE-TURN FLANGES

with the **NEW** Taper Face Flanges

CUTS FLANGE COSTS. For many applications of light-duty piping . . . up to 125 lb. W.O.G. pressure . . . the new TUBE-TURN Taper Face Flange gives rated performance at a lower price than conventional designs. Here's a good teammate for lightweight pipe and fittings in applications such as water, oil and gas distribution . . . on pumps and compressors . . . any installation where welded piping must be flanged to low pressure valves, pumps or equipment.

PROTECTS VALVES AND PUMPS. Lightweight and tapered face permit good seals with reduced bolt-loading on valve or pump flanges. Lighter, lower-priced valves can be used without danger of cracking their flat faced cast iron flanges. Also, lighter neck of flange speeds up welding to pipe.

with all **TUBE-TURN** Flanges



YOU SIMPLIFY ENGINEERING. There's a complete line . . . all types, sizes, capacities, materials. You can specify TUBE-TURN Flanges and know you'll get the exact answer to your problem. Also, Tube Turns offers you engineering help.

YOU STREAMLINE PURCHASING. Your nearby Tube Turns' Distributor provides complete-line service. This one source for all your needs in welding fittings and flanges enables you to put *all* your requirements on *one* order . . . to cut red tape, save valuable time.

MAIL FOR BOOKLET The New line of Taper Face Flanges is described in this Tube Turns booklet . . . free on request.

TUBE TURNS, Dept. N-1
224 East Broadway, Louisville 1, Kentucky

Please send free Bulletin on Taper Face Flanges.

Company Name _____

Company Address _____

Your Name _____

Position _____

City _____ *Zone* _____ *State* _____

Available from your nearby TUBE TURNS' distributor

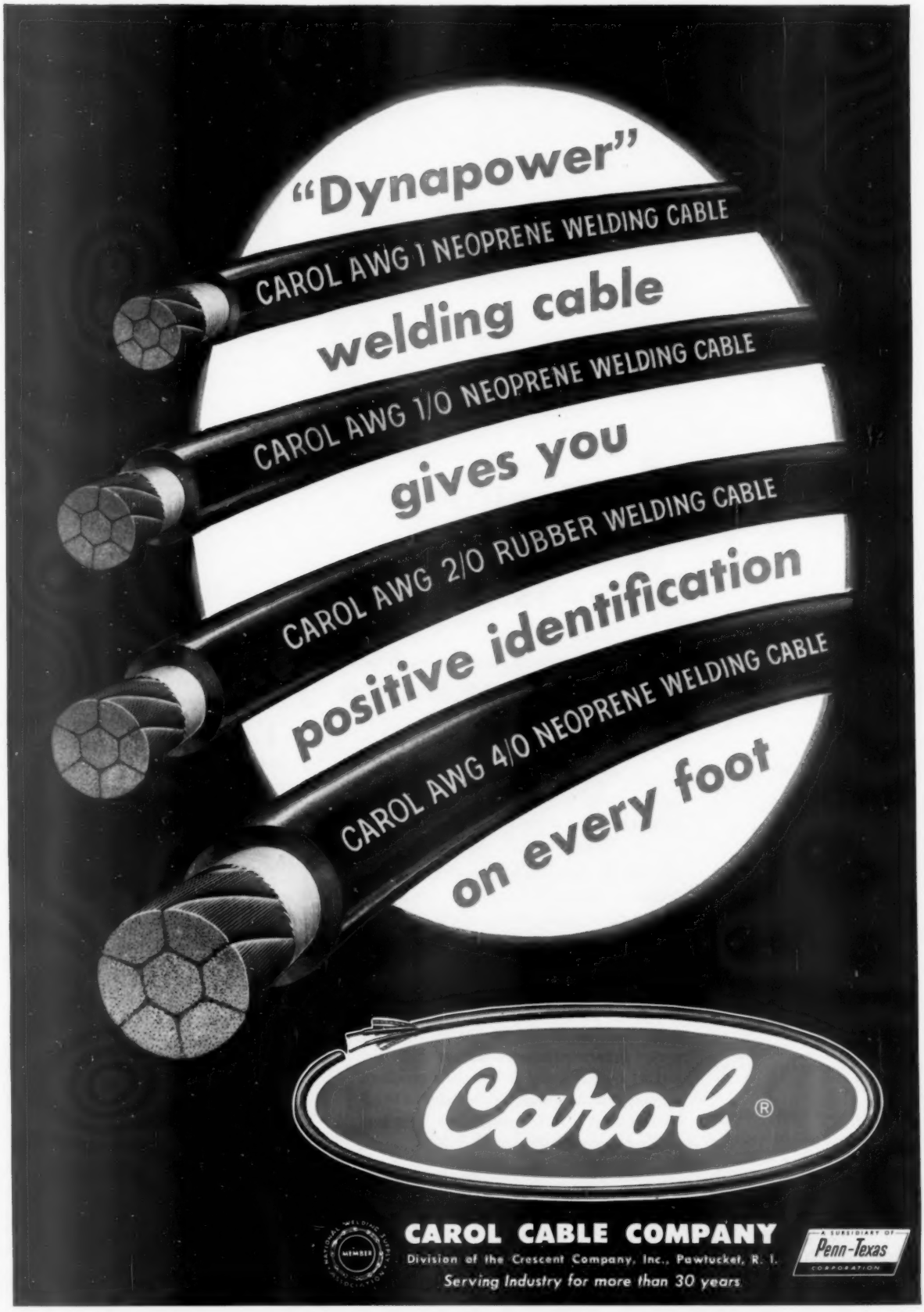
*"TUBE-TURN" and "tt" Reg. U. S. Pat. Off.

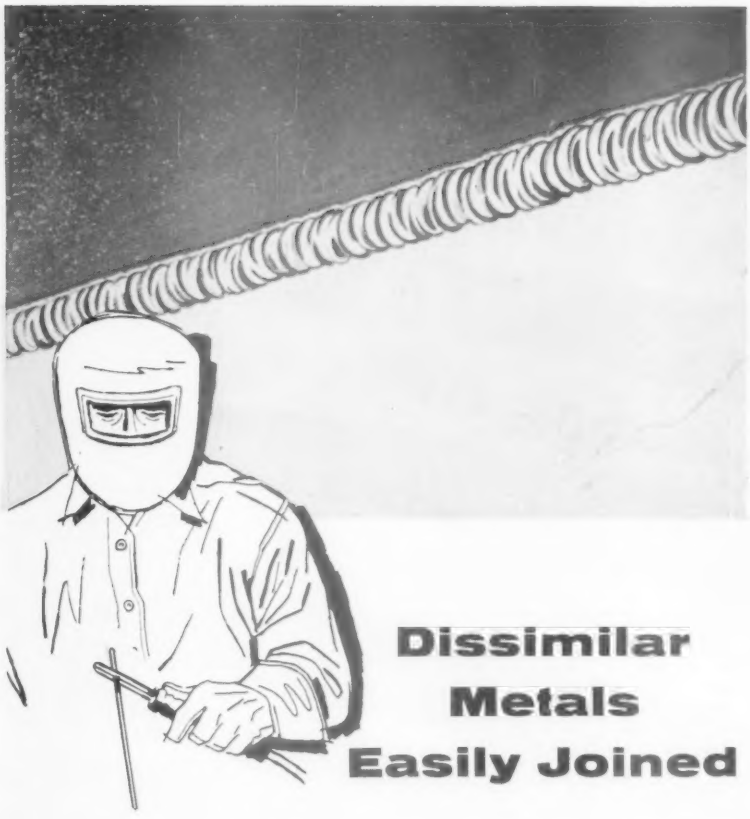
TUBE TURNS

LOUISVILLE 1, KENTUCKY

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

New York • Philadelphia • Pittsburgh • Cleveland • Detroit
Chicago • Kansas City • Denver • Los Angeles • San Francisco
Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas


"Dynapower"
CAROL AWG 1 NEOPRENE WELDING CABLE
welding cable
CAROL AWG 1/0 NEOPRENE WELDING CABLE
gives you
CAROL AWG 2/0 RUBBER WELDING CABLE
positive identification
CAROL AWG 4/0 NEOPRENE WELDING CABLE
on every foot
Carol®
CAROL CABLE COMPANY
Division of the Crescent Company, Inc., Pawtucket, R. I.
Serving Industry for more than 30 years
A SUBSIDIARY OF
Penn-Texas
CORPORATION



Dissimilar Metals Easily Joined

You get high-strength, crack-free welds with

AMPCO-TRODE* 10 ELECTRODES

Ampco-Trode 10 electrodes give you strong, crack-free welds — even when used to join dissimilar metals, such as cast iron to steel, bronze to steel, etc.

Difficult metals are joined faster and better too. Ampco-Trode 10 electrodes are designed for joining iron-base metals and alloys, i.e., malleable iron, cast iron, manganese steel, tool steel, as well as copper- and nickel-alloys.

You get the advantages of versatility with Ampco-Trode 10 electrodes. You make intermediate hardness (130-150 BHN) overlays and inlays with excellent bearing qualities and high resistance to all forms of wear. The deposits also resist corrosion from salt water, acids, mild alkalies.

Order Ampco-Trode 10 from your Ampco distributor.

*Reg. U. S. Pat. Off.

AMPCO®

AMPCO METAL, INC.

DEPT. WE-175, MILWAUKEE 46, WISCONSIN

THE METAL WITHOUT AN EQUAL

W-139

HERB Quartz supervises welding of 28-gage stainless steel channel to turbine blades.

50 years a weldor

Herbert Quartz, said to be the oldest living oxyacetylene weldor in the U.S., concludes his recollections of the early days of the welding industry.

THE PERIOD around 1909 marked the first time that oxyacetylene welding was used on railroad equipment. When Herb Quartz became welding foreman at the Columbus, Ohio, plant of Buckeye Steel Casting Co., the firm was doing such welding for two major railroads.

In the early days of oxyacetylene welding, steel up to 3 in. thick was flame-cut with a torch. However, it was necessary to attach a separate oxygen line by wiring a copper tube with a small tip to the torch right next to the primary tip. A control valve was soldered onto the tube and the oxygen hose was connected to it.

When the Buckeye plant obtained its first metal arc welder in 1914, efforts were made to join some steel castings with a 200-amp d-c machine. However, all welds broke.

After some experimenting, Herb hit upon the idea of preheating the casting. When this was done the welds not only held, but the job was finished sooner and was as good as that obtained with oxyacetylene.

In 1917, Herb left the Buckeye

plant and went to work for the Pennsylvania Railroad in Columbus where both carbon and metal arc welding were used. Almost every component part of a locomotive was welded.

Turbines Welded

The following year he obtained a leave of absence and headed for Allis-Chalmers Mfg. Co., Milwaukee. The firm had a contract for marine turbines for the U. S. Navy.

The turbines had to withstand pressures of 500 psi. Their design was such that foundries could not make them without numerous shrinkage cracks. All efforts to weld them proved unsuccessful.

Herb had a go at welding the castings, but not in the machine shop. The job required preheating as well as annealing, so the castings were welded in the forge shop where a furnace was available.

Welding Rods

Preheating and annealing proved to be the difference between success and failure. Fifty-one cylinders and eight months later the job was completed. It wasn't long after this that Herb was offered a foreman's position at Allis-Chalmers, which he accepted.

Coated electrodes, as we know them today, made their appearance in the twenties. They were introduced at Allis-Chalmers when a transformer tank sprang a leak and defied all efforts to weld it with a bare electrode.

A. O. Smith Corp., which had developed a coated electrode, sent a weldor to A-C on a demonstration trip and, while there, he successfully welded the transformer tank.

As the art of welding progressed through various stages, Herb was one of the pioneers who sought out the best usage qualities of increasing electrode types. He was also one of those who took a hand in the struggle for electrodes of uniform character and quality. Today, thanks to the efforts of these men, there is little chance that one electrode will not be exactly like the one packed next to it.

As exemplified by the long and successful career of Herb Quartz, experience has often been the best teacher in the development of welding improvements. And as long as men like Herb use past knowledge with an eye to future improvements, the welding industry will never suffer from "static-itis."

Light weight torch cuts 4"steel-*FAST*-at low pressures

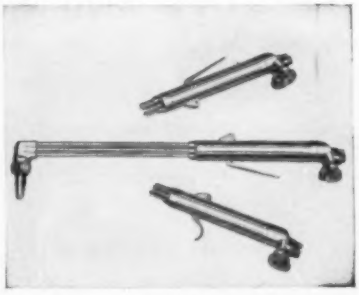
SMITH'S **Silver Star☆ CUTTING TORCH**

This is a light torch—only 2 lbs. 9 ozs. for the 20½" length. But, the way it cuts thick steel at low gas pressures is something to see. Eight pounds is all you need to cut up to ½" steel. For heavier cuts, pressures are proportionately low. Oxygen consumption reduced by 50% in some cases. That's real economy!

Another thing: You don't need a wrench with this torch! Tips slip into torch head, tighten with twist of fingers. That's a time saver! (Special Smith patent.) Lever Over Handle, Lever Under Handle, or Trigger — you have all 3 in this one torch to suit all operator requirements. Ask us for complete details on this sensational new cutting torch.

Only 8 lbs. gas pressure cuts ½" steel

Observers can't believe their eyes when they see this new Smith's Torch cutting ½" steel with only 8 lbs. oxygen pressure. Look at the gas you save! This torch costs less to operate.



Saves up to 50% oxygen

That saving counts up over a period of time! Even heavy cuts up to 10" take less gas than ordinary equipment. This torch is versatile and economical. "Burners" told us what they wanted and we built those features into this torch.

Full information on request — mail coupon

SMITH WELDING EQUIPMENT CORP.

DEPT. WE-175 • 2633 S.E. 4th Street • Minneapolis, Minn.

NAME_____

ADDRESS_____

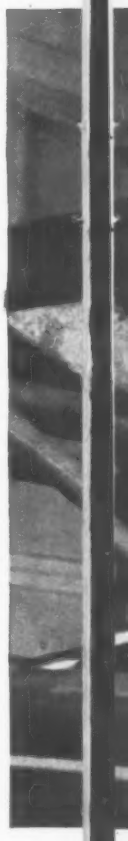
CITY_____ STATE_____

At the McLendon Manufacturing Company . . .

Production increased 15% on engine mounts

"By switching to this General Electric welder we have all but eliminated downtime and have increased our production 15%. Our welding section is now 100% General Electric."—J. W. McLendon, President, McLendon Manufacturing Company.

"I'm sold on the machine. It has better arc striking quality than our previous m-g sets. Anyone can strike an arc with this welder. With the added arc force you get an instantaneous start of the weld."—W. E. McWilliams, weldor.



EXECUTIVE AND WELDOR AGREE IN SPECIFYING G-E WELDERS

Producing engine mounts that must withstand the vibration of 1500-horsepower, 3000-rpm engines, the McLendon Manufacturing Company demands welding equipment that gives them:

A STABLE ARC

STABILITY OF CURRENT

FLEXIBILITY OF CONTROL

ECONOMY OF OPERATION

With their General Electric 300-amp d-c rectifier welders they get all this . . . and more. J. W. McLendon, president of the Tulsa, Oklahoma, firm says, "After testing one of these units, I suggested we standardize on General Electric equipment. Now our welding section is 100% General Electric. By using the G-E welder and your W-616A and 100-16A electrodes we have a combination that gives cleaner, more uniform, and smoother welds."

Back in the plant, weldor W. E. McWilliams is pleased with Mr. McLendon's choice of equipment. "With our old welders," he says, "we had a lot of downtime for maintenance and repair. This always meant somebody was out of work for a while. Now, as Mr. McLendon says, with the General Electric equipment, we have reduced downtime practically to zero, and increased our production 15%."

The engine mounts welded by McLendon must be lightweight, yet strong enough to withstand the vibration from the powerful aircraft-type engines.

After the engine is placed on the mount, it is lifted onto a specially designed truck body. It is then used in oil producing areas as part of a mobile fracturing unit for increasing the flow of oil wells. To date there have been no structural failures on any of the great number of McLendon units in operation.

General Electric rectifier welders are designed to make the weldor's job easier while making surer strength welds at lower cost.

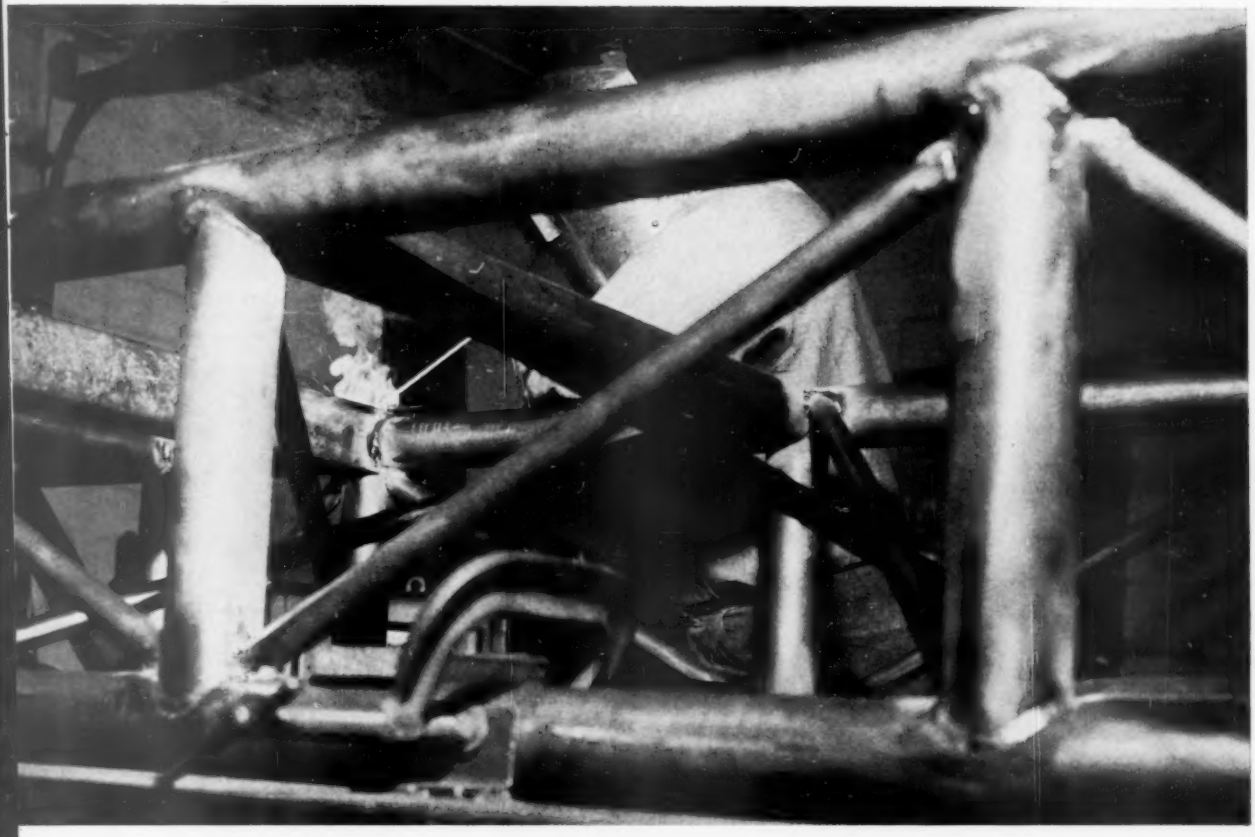
Exclusive, full-time arc force control permits welding with shorter arcs than are possible with any other rectifier welder.

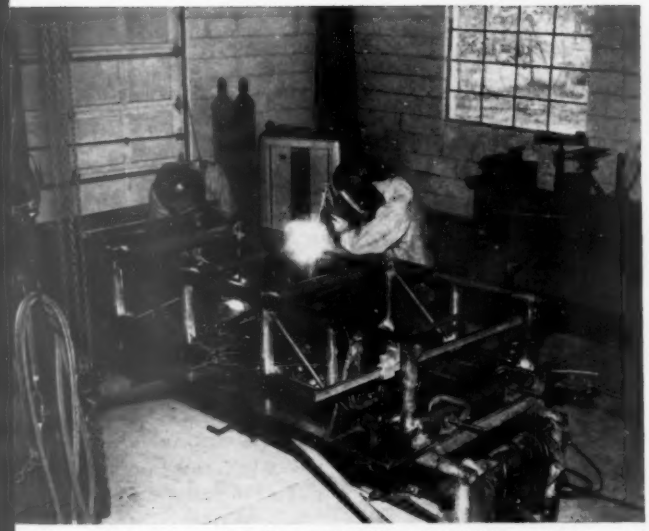
The large, easy-to-read current scale is expanded at the lower range. It allows for pinpoint settings at these lower ranges, where accuracy is most important.

For more information see your nearest General Electric Welding Distributor. He is listed in the yellow pages of the telephone book under "Welding Equipment, General Electric." Or write directly to Section 711-7, General Electric Company, Schenectady 5, New York.

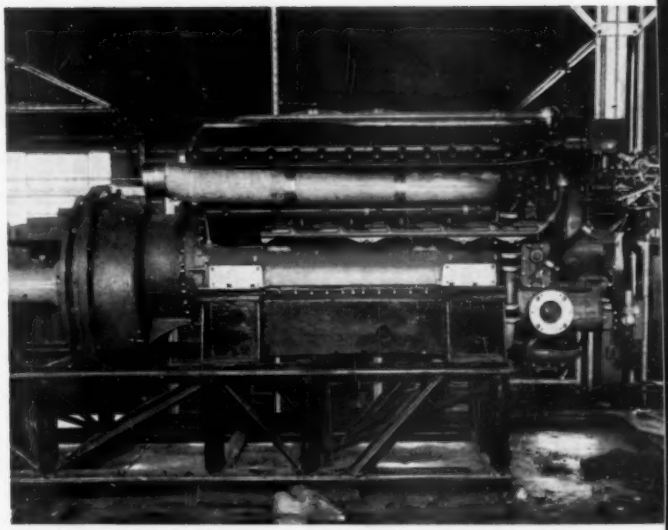
GENERAL ELECTRIC

with General Electric rectifier welders

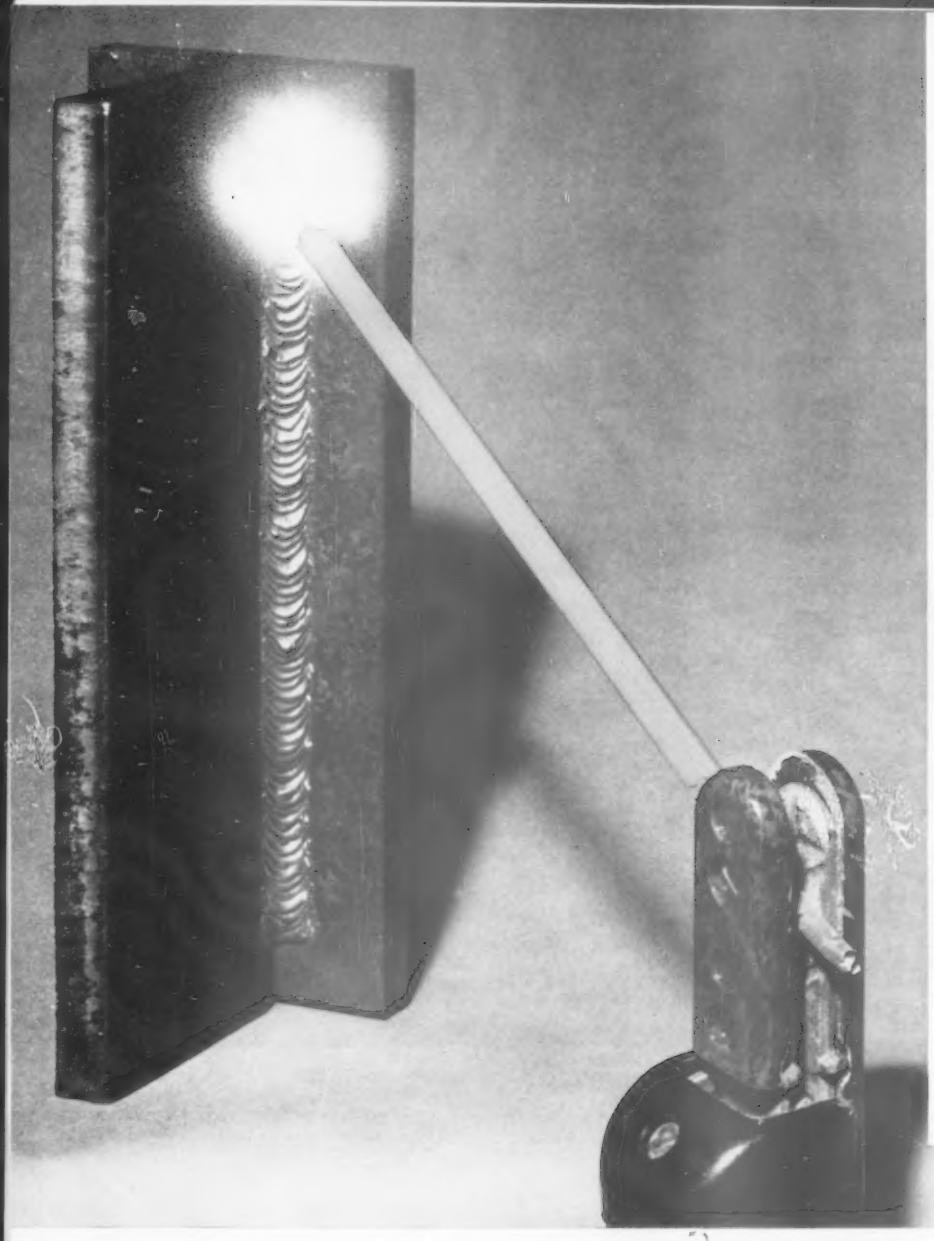


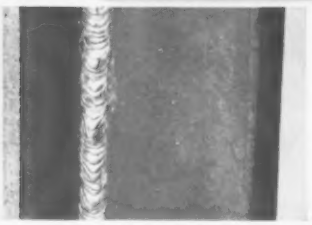


Weldors Kurt Mueller and William McWilliams finishing off an engine mount. It consists of 85 separate pieces of tubing requiring 172 individual welds varying from one to 30 inches long. Tolerances are $\pm \frac{1}{64}''$ high and $\frac{1}{32}''$ wide. Metal used is 10-gage seamless tubing, AISI 1015 steel, .25 carbon.

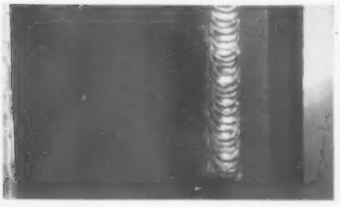


A 1400-pound, 1500-horsepower engine on frame welded with G-E rectifier welders and electrodes. Engine and frame are placed in truck bodies and used with other equipment for work in increasing flow of oil wells. Welded frame must be able to withstand terrific vibration encountered in field operation.

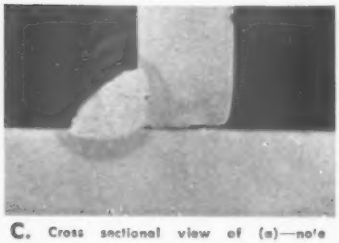




A. Fillet weld using conventional E-6010 Electrode—vertical-up position.



B. Fillet weld using General Electric Strikeasy 610—vertical-up position. Note smoother, more even ripple.



C. Cross sectional view of (a)—note wagon tracks along edges.

D. Cross sectional view of (b)—note flat, even bead—wagon tracks eliminated; no areas for slag entrapment.

NEW IRON-POWDER E-6010 ELECTRODE PRODUCES BETTER WELDS IN ALL POSITIONS

IT'S GENERAL ELECTRIC'S NEW STRIKEASY 610

An E-6010 electrode with an iron-powder coating is now available in General Electric's new all-position Strikeasy 610.

It features:

- Outstanding flexibility, ease of use, and greater deposition rate.
- Excellent wetting action allowing quick and easy whipping technique with greater speed and reduced "wagon tracks."
- Maintains shielding to the full usable length of the electrode.
- Superior bead shape improves ductility, (26% in 2 inches), simplifies slag removal, and improves appearance.

A few of its many applications include tanks, pipe line, steel casting repair, galvanized plates, and ship fabrications.

For more information contact your nearest General Electric welding distributor, or write Section 715-4, General Electric Company, Schenectady, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

TRADE NAMES* OF ELECTRODES AND COMPARABLE AWS-ASTM DESIGNATIONS

Designation	E-4510	E-6010	E-6011	E-6012	E-6013	E-6014†	E-6016	E-6020	E-6024	E-6027	E-7010	E-7020
Weld positions	V, F, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	F, V, OH, H	H-Fillet, F	H-Fillet, F	H-Fillet, F	V, F, OH, H	H-Fillet, F
General Description	Wire—coating applied before drawing	Heavy coated D-C pos.	Heavy coated A-C or D-C	Heavy coated D-C neg. or A-C	Heavy coated A-C	Iron Powder A-C or D-C	Low-hydrogen D-C pos. or A-C	H. coated A-C or neg. for fillets, A-C or pos. for flat	Iron Powder A-C or D-C	Iron Powder A-C or D-C for flat, A-C or neg. for fillets	Heavy coated D-C pos. only	H. coated A-C or neg. for fillets, A-C or pos. for flat
MANUFACTURER												
Air Reduction[1]	41 or 63	78E	230	323 or 387	90, 90A, 90B	Easyarc 14	312	306 or 315	Easyarc 12		93	94
Champion	Sulcoat	Blue Devil	Bluedac	Gray Devil Gray Devil 2	Graydac Tan Devil	Speedemon 14	Hy-Lo Speedemon 716	Black Devil	Speedemon 12		Blue Devil 85	Black Devil 75
General Electric	Type F Type L	W-610A W-610B	611A	W-612A W-612B W-612C W-612D	W-613A	Strikeasy 614	W-616A	W-620A W-620B W-620C W-620D	Strikeasy 1		W-710A	W-720A
Harnischfeger	Washcote	AP or APV	AC-1	PF, PFA or WE-8	AC-3 or SM	DH-6	70LA1 170 LA	DH-2 or DH-3	DH-5		CM-50	CM-50-1
Hobart	Sulcoat	10	335	212 or 12	447, 313, 13	Rocket 14	Rocket 716	111	Rocket 24	Rocket 27	885	
Lincoln	Stable-Arc	Fleetweld 5 Lightweld Fleetweld 5-P	Fleetweld 35 or 180	Fleetweld 7 Fleetweld 72 Fleetweld 73	Fleetweld 37 Planeweld 2	Fleetweld 47	Shieldarc LH-70		Jetweld 1 Selfweld	Jetweld 2	Shieldarc 85 or 85-P	Jetweld 2HT
Marquette	101	105	130	120	140, 151		7016	115	Marq-Rod 12			
McKay	21	15 or 15-D	11	17 or 116	24		Pluralloy 70AC	16	Comet Arc			
Metal and Thermit[2]	Sulcoat	Type R	Type A	Genex Genex M Genex C Type N13	Type U Alternex Type U13	Speedex U	Type HTS	Type FHP or Type D	Speedex	Speedex LH	Molex	Type DM
National Cylinder Gas	Sureweld 30S	Sureweld B	Sureweld CB	Sureweld N, G or NM	Sureweld C, CN or CE		7016	Sureweld FD	Sureweld 24	Sureweld 27	Sureweld MLY-50	Sureweld MLY-A
Reid-Avery[3]	D or Blue Label	7	11	8	13	7016	6016		6024	6027	74	64
Shober Sales		32	11, 33	34	35			66	36			
A. O. Smith		SW 10	SW 14	SW 12 or 17	SW 15 or 16	SW 46	SW 65	SW 35	SW 44		SW 75 or 80	SW 76
Westinghouse	18 Sulcoat	AP or XL-610	ACP-611	FP-612 or FP-2-612 SW-11 SW-29	SW-613 or SW-2-613 or SW-3-613	Zip 14	LoH-2-616	DH-620	Zip 24	Zip 27	XL-710	DH-720

*Trade name or Type No. is usually prefixed by company name.

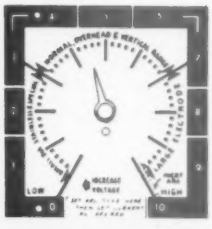
†Not as yet a recognized standard by American Welding Society.

V = vertical, F = flat, OH = overhead, H = horizontal, H-Fillet = horizontal fillet. [1]Airco prefix. [2]Murex. [3]Raco prefix.

...for those tough "HARD to WELD" jobs

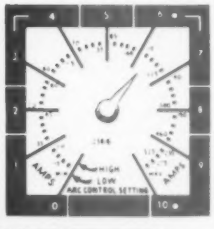
VICKERS Controlarc* DC Welder

Right at your fingertips—exact control—compact, light weight for truly versatile performance



SELECTION OF ARC TYPE

for different welding jobs, and adjustment necessary to suit your individuality and the welding job.



DUAL CONTINUOUS CONTROL

in a rectifier welder. Can vary the current from minimum to maximum, and vary the type of arc, with continuous stepless self-indicating dials.

*TRADEMARK

Gives You REMOTE CONTROL of CURRENT and TYPE of ARC

Even in those tight, cramped places, where there's hardly room to turn around, this handy little remote control box goes right with you. No matter what your welding position, you can "dial" the exact arc you need, without running back to the welder to change range switches and taps. Only the Vickers CONTROLARC gives you this individual control of current and type of arc in convenient remote control operation.

AND ONLY THE CONTROLARC GIVES YOU THESE EXCLUSIVE OPTIONAL FEATURES

Constant Potential (CP) Adaptor • Slope Controller

WRITE TODAY

for more information on this versatile welder.

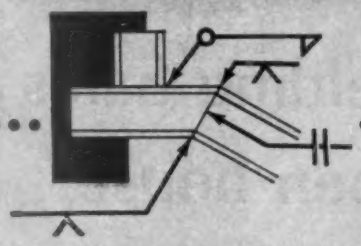
DESIGN ENGINEERS:

There are openings in our expanding program. Write for details.

VICKERS ELECTRIC DIVISION

VICKERS INCORPORATED a unit of Sperry Rand Corporation

1851 LOCUST STREET • SAINT LOUIS 3, MISSOURI



the welding clinic

Here you may find the solution to your welding problems, whether they concern design, production, construction or maintenance welding. Submit your questions for answering on this page.

Properties of acetylene

Question:

I'm having difficulty hardfacing plowshares with manganese steel electrodes on d-c. Deposits immediately behind plow points are cracking. Can you tell me why?

Answer:

Manganese steel is not the right material to use in hardfacing plowshares. When deposited on plowshare metal, it becomes extremely brittle.

We would recommend use of a hardfacing material with high hardness in its deposited condition. This material should be deposited on the upper surface of a share to produce a self-sharpening action.

See your local welding supply salesman; he can provide you with several good hardfacing materials.

Question:

I have been working with acetylene as a companion gas to oxygen in welding and cutting steels at our plant for nearly a year. Although I have not experienced any particular difficulties with this gas, I would like to learn more about it. How wide is its explosive range? When can it be dangerous? Any other information on acetylene would also be appreciated.

Answer:

Acetylene, an unsaturated hydrocarbon gas, has one of the widest existing ranges of explosive limits—a lower limit of 2.5%, and an upper limit of 82%.

It is manufactured by the reaction of water on calcium carbide (a gray, rock-like material). Chemically known a C_2H_2, acetylene forms an explosive mixture if combined with a certain proportion of air.

It is a colorless gas possessing a sweet odor and taste. If unpurified, it has a biting, nauseating odor which can be easily detected even if strongly diluted with air.

Under low pressure and at normal temperature, acetylene is a perfectly stable compound. A spark introduced into it under such conditions will not spread any appreciable distance; flame effect is confined to an area immediately around the spark.

However, at pressures greater than two atmospheres (29.4 psi absolute, or 14.7 psi gage), acetylene is unstable. It is usually compressed to much higher pressures in cylinders.

If kept sufficiently cool, the gas can even be liquefied. At an extremely low temperature, it has been possible to produce acetylene in solid form.

When compressed in cylinders, the gas will, under slightest provocation, completely dissociate into its chemical components (carbon and hydrogen) with an accompanying increase in temperature and pressure.

Maximum Gas Flow

Contained inside these cylinders is a porous material saturated with acetone which dissolves acetylene rapidly. Acetone is a highly-flammable liquid with a distinctive odor. Up to 300 volumes of acetylene may be dissolved by 1 volume of acetone under pressure of 4,100 psi.

Nevertheless, acetone-acetylene mixtures *can* be safely compressed, stored and handled. Acetylene can be drawn off and used, leaving acetone in the container.

Experience has proved that if maximum gas flow from an acetylene cylinder does not exceed 1/7 of cylinder capacity within one hour, the amount of acetone drawn off is negligible.

If welding operations call for greater gas consumption, two or more cylinders should be connected in series or to a manifold so that all cylinders may be turned on at the same time.

Hoses connecting the manifold to the torch contain enough acetylene to develop an explosive mixture when the gas is released into a large tool box. Many careless workers have been victims of such explosions.

Because of its wide explosive range, you can never be too careful in using acetylene. Remember, the gas can be useful and safe only if safe procedures are followed.

HERE'S AN ANSWER . . .

. . . to the article, "Comparative testing confirms oxypropane cutting value" *(WELDING ENGINEER, Feb., 1956, p. 22)*. Author Jay Bland of Standard Oil Co. reported the results of his firm's flame-cutting experiments on steel using both acetylene and propane with oxygen. The tests made quite a case for propane, and our readers have been waiting for the reply that had to come. It's here, and scheduled for the February issue.

Prepared by J. Okladek of Canadian Liquid Air Co., Ltd., it's a precise and documented comparison of the two gases that users—and prospective users—can't afford to miss!

Some goings-on as . . .

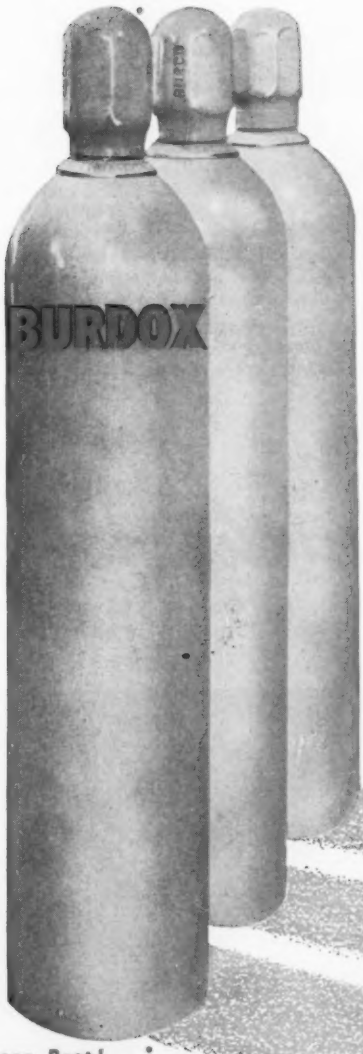
Chicago Welding Sales holds an open house

ABOVE: Founder of Chicago Welding Sales, S. H. Shaykin, and Vice President Irving R. Silver stand still for a photo before the Metal & Thermit Co. booth. York Engineering Co., a manufacturing division of Chicago Welding, also was acquired by Mr. Shaykin. RIGHT: United Wire & Supply Corp., one of 11 exhibitors at the open house celebrating the opening of new quarters for Chicago Welding Sales, evidently had the answers to questions posed by these visitors. BELOW: Some of the more than 900 visitors to Chicago Welding Sales two-day product display stop for a look at weldor's helmets exhibited by Fibre-Metal Products Co.

RIGHT: Flame-cutting unit manufactured by Heath Engineering Co. is operated in special fireproof room by Jim West of W & S Welding Service. Heath booth was in another part of the building.

LEFT: Representative of Miller Electric Mfg. Co., Inc., checks on product data for open house visitor. In foreground is firm's portable spot welding unit suspended from wire cable.

Wherever you see this name...



someone is saving time, money and doing a better job of

CUTTING OR WELDING

The choice of BURDOX for any welding or cutting job is the first step toward getting the best results at the lowest cost. Since BURDOX handles *all* products and processes for *all* types of welding and cutting, you can select the least costly, most adaptable, most productive process or product for *your particular requirements.* You'll find, as thousands have, that checking with BURDOX *first* guarantees better, faster, lower cost welding and cutting. Send coupon for free catalog.

Every Product...every Process to fit every Purpose Best!

Please send Free BURDOX Catalog

Name .....

Firm .....

Address .....

City ..... Zone ..... State .....

MAIL COUPON TODAY!

THE BURDETT OXYGEN CO.

3302 Lakeside Ave. • Cleveland 14, Ohio

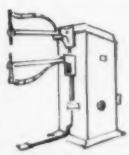
PLANTS:
Cleveland, Dayton, Findlay, Mansfield, Youngstown, Ohio and Los Angeles California

BRANCHES:
Akron, Cincinnati, Columbus, Ohio

Industrial Gases

Gas Welding Equipment

Arc Welding Equipment


Spot Welding Equipment

Soldering, Brazing Equipment

Safety Equipment

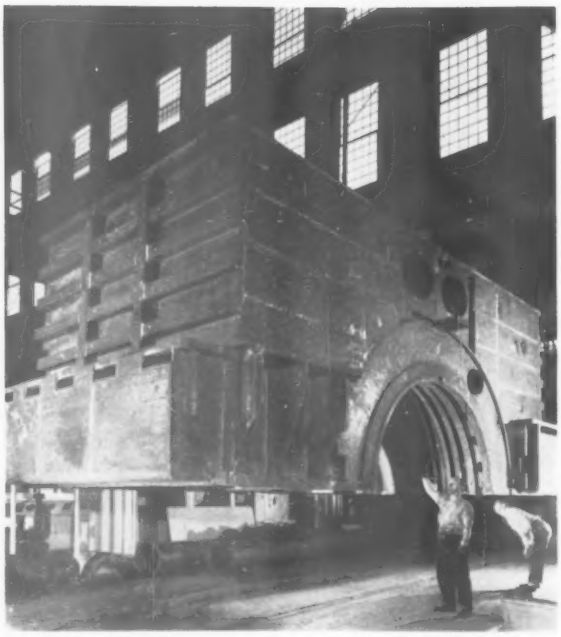
Cutting Equipment

Accessories

—Welding Engineer photo

PILINGS are welded for new Nickel Plate Road overpass, crossing U. S. Route 6 just west of Lorain, Ohio. Weldors are joining bottom plate of ¾-in. mild steel to piling, which has wall thickness of 3/16 in. They are using E6010 electrodes of 3/16-in. diameter in one fillet pass. Power source is 300-amp motor-generator welder.

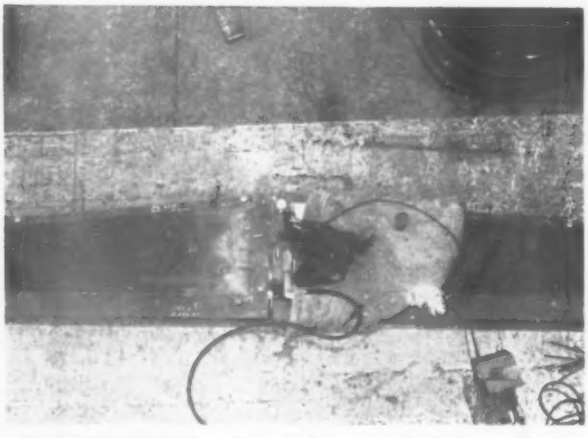
On the job . . .



MEASURING 12 ft high, 15 ft wide and 30 ft long, 98-ton base section for low-pressure element of the world's first 300,000-kw steam turbine generator unit is heaviest weldment produced to date for a steam turbine by Allis-Chalmers Mfg. Co., Milwaukee. Used in welding were E6010, 6011, 6020 and 6030 electrodes, with power from a 440-volt a-c transformer. Upper and lower halves of the section were fabricated in sub-assemblies using combination of automatic and hand welding. Final assembly was welded in position shown. Entire steam turbine generator unit will weigh 1,615 tons.

—Courtesy Handy & Harman

ASSEMBLY, part of bicycle frame, is vertical member supporting seat post. Because of stresses encountered in service, upper end of tube is reinforced with short tubular insert. Tube and insert are brazed together. Dimple punched in side of insert allows preplacing of silver alloy for brazing insert inside longer tube. Dimple on opposite side of insert holds second piece of brazing wire to produce uniform joint.



SEMIAUTOMATIC submerged-arc method is used in fabrication of strut for wind tunnel boom. Weldment, 331 in. long, was made at Westinghouse Sunnyvale (Calif.) plant, using T-1 steel in plate thicknesses of 2½ and 8 in. Submerged-arc weld deposits were equal or greater in strength than base plate after stress relief: 105,000 psi minimum tensile and 90,000 psi minimum yield strengths.

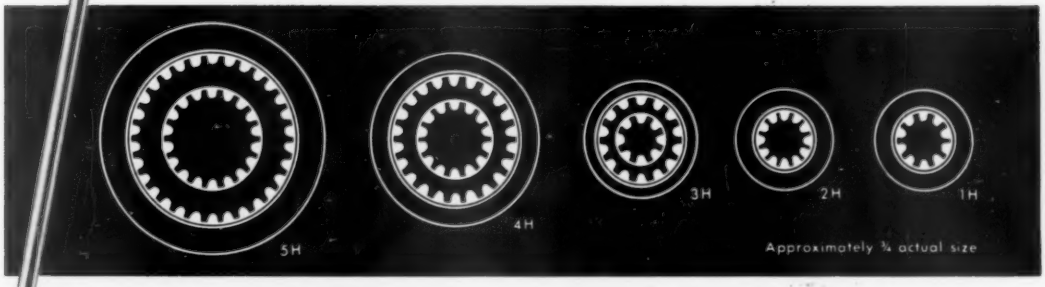
SUPER HEAT

From a Super HEATING-TORCH

The HARRIS K-23

Where intense heat is required, hundreds of metal working plants have found the answer in the Harris K-23 Super Heating-Torch.

Designed by Harris engineers for either Propane, city or natural gas in combination with oxygen, you can do your heating job faster, better and more economically than by any other method.



The scientific design of the Harris 2290H multi-flame tips practically eliminates heat loss.

(Torches for natural gas and propane, with compressed air, also available. Information on request.)

HARRIS

HARRIS CALORIFIC CO.

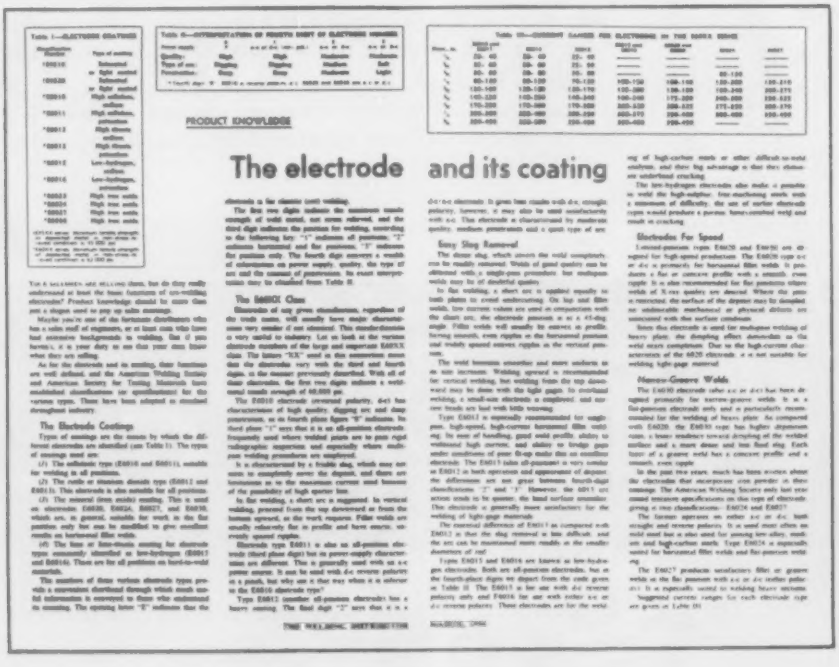
5501 CASS AVE. • CLEVELAND 2, OHIO

THE WELDING

Distributor

Welding's begins

This article was the basis for sales meetings which were held to better inform distributor salesmen. Editorial material that invites such action will provide a stimulating atmosphere for your distributor sales message.



PRODUCT KNOWLEDGE

The electrode and its coating

THE WELDING DISTRIBUTOR is the most effective means you have for presenting your confidential sales message to distributors of welding supplies and equipment. Plan now to use both THE WELDING DISTRIBUTOR and WELDING ENGINEER in your 1957 selling campaign.

first merchandising magazine publication with the March issue

The pilot issue of THE WELDING DISTRIBUTOR prompted 126 distributors to write us. Here are some typical letters and excerpts from others:

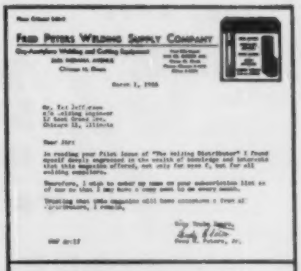
". . . we enjoyed it very much. It is a wonderful idea, and we would like to receive it regularly in the future."

". . . check enclosed. Send 11 additional copies for my salesmen."

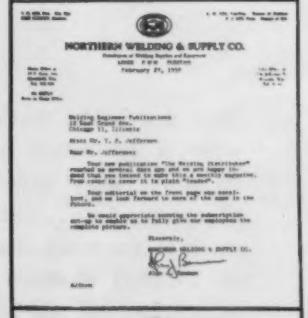
"We liked the pilot edition very much and feel it will fill a gap for the welding supply dealer."

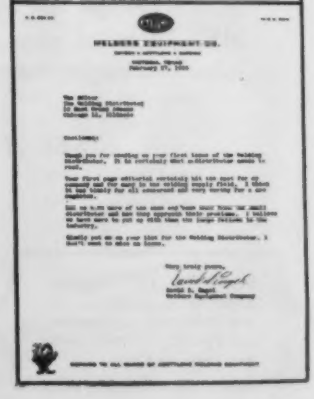
". . . you have something very instructive and informative in your new magazine."

"You have developed a very interesting magazine in a field that needs it."


FRED PETERS WELDING SUPPLY COMPANY

Acme Welding Supplies, Inc.


NORTHERN WELDING & SUPPLY CO.


WELDERS EQUIPMENT CO.

RANKIN OPENS ADDITIONAL TERRITORIES TO AGGRESSIVE DISTRIBUTORS

Manufacturer of RANITE—the ORIGINAL Metallic Coated Hard Surfacing Rod—Sets New Sales Expansion for 1956

This year, Rankin Manufacturing Co., one of the pioneer manufacturers of hard surfacing welding materials, moved into its biggest promotion of RANITE to create a new premium market for RANITE distributors. To cover the need for increased distribution, new sales territories are being added to the existing Rankin network . . . which means you can now stock and sell RANITE, the welder's choice, in a ready-made market.

NEW APPROACH TO PROFITS

Join now with RANITE distributors throughout the world in sharing in the new approach to profits. To assure sales and profits, Rankin is also taking a new approach to promotion of RANITE and metallic coated hard surfacing welding materials. Now, through trade publications, direct mail and RANITE field representatives, Rankin is conducting a long range educational program to show welders, superintendents, owners, master mechanics, purchasing agents and others how to get the most out of their hard surfacing in wear, economy and time saved by using effective application techniques proven successful by repeat RANITE users.

DESIGNED FOR YOU

Rankin's whole promotion program has been set up to provide a new hard surfacing welding material market for you through RANITE. RANITE has long been accepted as one of the leading hard surfacing welding rods. Welders look to the familiar RANITE wood container as the sign of a smooth running, rapid deposition and easy-to-use rod.

GET THE COMPLETE RANITE PROFIT STORY NOW

Fill out the attached postage free card now and send it on its way to Rankin Manufacturing Co. Available territories are now open for new profit-making RANITE franchises.

SEE REVERSE SIDE FOR FACTS ON WHY RANITE IS THE WELDER'S NO. 1 CHOICE

FIRST CLASS Permit No. 512 Alhambra, Calif

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States
Postage will be paid by

Rankin Manufacturing Co.
616 Marengo Ave.
Alhambra 2, Calif.

This ad appeared in the March, 1956, pilot issue and pulled 68 responses. From these the manufacturer signed 15 new distributors . . . that's mission accomplished.

Imagine a holder weighing half as much as your helmet!

capacity
300 AMPS
ELECTRODES
1/4 - 1/16

TRY

MODEL AL-300

TWECOTONG

it weighs just 13½ ounces

Here is a holder that's made for the man who wants a lightweight holder for easier welding. Its lower body and upper lever are forged aluminum alloy . . . with current carrying capacity equal to the much heavier copper alloys. Like all TWECO electrode holders, TWECOTONG AL-300 has tips and body insulation of SUPER-MEL laminated glass cloth . . . the toughest, safest and longest lasting holder insulation made.

The upper and lower jaws of AL-300 TWECOTONG are quickly and easily replaceable, as are all other parts. The jaws hold the electrode with a vice-like grip so you know where it is at all times; yet they open easily to change rods. You can install this holder on the line in one minute flat. Just bare the cable end, insert it in the reamed hole in the holder body and tighten one cone shaped screw . . . that's all!

SEE YOUR LOCAL WELDING SUPPLY DISTRIBUTOR

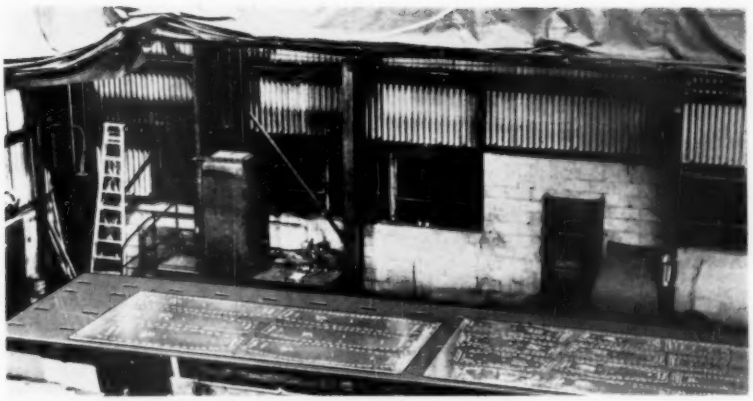
Write for FREE Catalog picturing complete line of Arc Welding Accessories and TWECO-LITE Aluminum Arc Welding Cable.

Tweco

MANUFACTURERS OF ELECTRODE HOLDERS • GROUND CLAMPS • CABLE CONNECTIONS FOR ELECTRIC WELDING

BOSTON AT MOSLEY • WICHITA, KANSAS, U.S.A.

Optical marking speeds plate cutting



PLATES layed out for optical marking. Curtain at upper edge of photo is raised to permit use of crane, then lowered during projection.

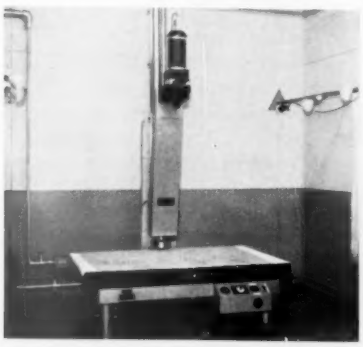
By Fritz M. Hessemer
Superintendent, Plant No. 2
S. Morgan Smith Co.
York, Pa.

IN 1952-53, S. Morgan Smith Co.'s over-all fabricating capacity was keyed to five layout men who produced sufficient work for 85 factory employees.

In 1956, using an optical marking system called "Lumotrace," five men are providing sufficient capacity for 150 factory employees, representing an increase in productivity of 76%.

The marking system entails photographing template drawings laid out to a 1/10 scale, and projecting the negative in full scale directly on work to be marked off.

This method has simplified conventional layout or lofting techniques. Commonly used in shipbuilding, it is currently finding many applications in the steel fabricating industry.



GLASS negatives are used in special camera to capture blueprint image. Control of flood lights on both sides is synchronized.

Some Results

Reasons for testing optical marking at Smith that have been substantiated by continued use are:

(1) Savings in man-hours. Eight highly-skilled layout men are replaced by three draftsmen and two helpers at the marking table—a net saving of 6,000 man-hours per year.

(2) Closer adherence to actual required plate sizes when ordering; better nesting of small components resulting in less scrap.

(3) Complete record of calculations and negatives for use on duplicate orders.

(4) More floor space available because it is unnecessary to line up two or three plates end to end as done previously.

The original layout system used by Smith was performed directly on steel plates, requiring that almost all steel be on hand before layout could start.

Using the new system, the firm now finishes complete development and layout for photographing prior to actual steel delivery. And, since optical marking requires much less time, delivery dates have been moved up approximately two months and steel inventory has been lightened.

First Use

There is evidence that optical marking was first tried in a Japanese shipyard about 1928. A more advanced form of optical marking was introduced to the aircraft industry about 1936, using a horizontal camera to photograph template drawings and make full-scale projection on workpieces.

Usefulness of this system is limited, however, by the small size of work (not exceeding 8 ft. in length) which can be accommodated. This limitation is imposed by the fact that the same lens system is employed for photography and projection to cancel out lens error. Maximum enlargement factor is only about 12 times negative size.

The Lumotrace marking method employs a separate camera and projector, using precision-matched lenses. It is possible to project negatives with magnifications up to 150:1, and still meet minimum layout tolerance. This means that plates up to 50 ft in overall length can be accommodated.

Glass Negatives

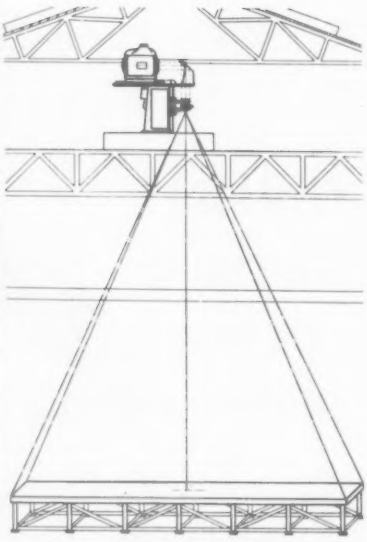
Drawings are prepared by Smith on special high-stability film. The drawings are then photographed on glass negatives which, in turn, are projected full-scale directly on plate to be marked off.

The camera is mounted on a vertical column fitted with prismatic slides and a power-driven lead screw for height adjustment. A flat-bed table with adjustable legs for leveling is attached to the column base.

The table is finely perforated and connected to a suction blower to keep the drawing flat for photographing. Floodlights are mounted on both sides of the table approximately 4 ft above the base.

All camera adjustments are permanently set. Exposure time, shutter release and floodlight control are automatic. The dark-room is equipped with standard facilities, plus refrigeration and heating equipment to maintain water temperature between 64 and 66 F.

The projector, mounted in a booth



SCHEMATIC diagram of optical marking set-up. Projector is mounted directly above marking table. Light source is 1,000-watt mercury vapor lamp. Three negatives holding up to 30 layout designs can be put in projector magazine and controlled automatically from table.

under the roof of the plate fabricating shop, stands directly above the marking table. Light source consists of a special water-cooled, 1,000-watt, high-pressure mercury vapor lamp.

Cooling System

A built-in air-cooling system supplies air across negatives, condensor and lens system to offset heat generated by the powerful light source.

Three glass negatives, each containing from 3 to 30 different piece-part layouts, can be placed in the projector magazine at one time. Movement of this magazine is remotely controlled from the marking table, bringing the projected image into proper dimensional adjustment by raising and lowering lens position.

Other separate controls move the image fore and aft and traverse it left and right. It can also be rotated through an angle of about 30 deg. The remote control unit has a slow-speed range for micrometer settings and a high-speed range for traversing and changing of negatives.

Marking is accomplished by center-punching the torch-cutting lines, and copying (with paint) all other information shown in the projected image. This is a direct copying process, so errors are practically precluded.

P&H Welding Positioners give you GREATER CAPACITY and GREATER VALUE for every dollar you invest

3000-LB. MODELS/LOAD-CAPACITY COMPARISON CHART

Capacity Shown Below at 12" off center of Rotation and Distances of Center of Gravity of Load from Table.

Distance Positioner	12"	18"	24"	30"	36"	42"	48"	54"	60"
P&H	**3000**	**2510**	**2160**	**1900**	**1690**	**1520**	**1390**	**1270**	**1180**
A	3000	2000	1500	1200	1000	–	–	–	–
B	3000	2250	1800	1500	–	–	–	–	–
C	2987	2187	1725	1424	1212	1056	935	839	760

This chart shows how a typical 3000 lb. P&H welding positioner handles loads far beyond the positions where competitive makes quit! P&H positioners handle big, bulky or odd-shaped weldments with ease because of these three features:

More table tilt — 135 degrees

More clearance for rotation — no legs or posts interfere

Higher table elevation — even under capacity loads

Capacities range from 500 to 100,000 lbs. Send for "Load Capacity Data Sheet No. 2" to help you select the positioner best suited to your needs. Write Bill Stephens, Sales Manager, Welding Division, Harnischfeger Corp., Milwaukee 46, Wis.

HARNISCHFEGER
P&H WELDERS · ELECTRODES · POSITIONERS
Milwaukee 46, Wisconsin

WELDOR joins heavy steel end bearing to 1¾ in. nickel steel plate used in body of butterfly type valves. Except for center bore, end bearings are solid steel at least 4 in. thick.

The right electrode spells e-c-o-n-o-m-y

HOW OFTEN have you cast a jaundiced eye at a welding process you are currently using and realized —for the umpteenth time—that its only recommendation lies in the fact that *eventually* it will get a job done?

The Henry Pratt Co. of Chicago had to do it just once too often.

Pratt was fulfilling an Air Force contract calling for fabrication of two 48-in. and two 66-in. butterfly type valves for use in a closed-circuit, controlled-atmosphere wind tunnel for testing aircraft engines.

An E8016 low-hydrogen electrode type was being used in this application, but it required preheat and the maintenance of that heat throughout the welding application.

Lost Time

Two hours of production time were lost each morning in bringing the weldment to a proper temperature. Heat was maintained by a gas-flame ring surrounding the work and this heat, combined with gas fumes, forced a 50% cut in the weldor's work time.

Two additional burdens that had to be borne by this naturally cost-conscious shop were the exorbitant amount of weld metal which had to be poured into the fabricated body shell and an exceptionally high spatter loss.

The long-needed switch was made by Pratt—to a low-hydrogen, iron-powder electrode, also an E8016 type.

This new electrode practically obviated the need for preheat and thus saved an initial two hours of production time each day. The thick steel billets are simply warmed to hand-heat to remove the chill from them.

Applied to the 1¾-in-thick body plate of the valves, the electrodes showed no appreciable spatter loss, and slag cleaning time was reduced to a minimum.

Steel Billets

Flange ring material on the valves is 3⅛ in. thick, and each valve has two heavy steel billets which serve as bearing housings for the valve disc. At their narrowest point, these billets have a wall thickness of 4 in.

A 3½% nickel steel is used in the fabrication of the Stressed Seal butterfly valves, as Pratt calls them, because of the wide temperature range encountered in the test procedures. Variations from —100 F to +650 F had to be planned for.

Greater weldor ease and comfort were among the many advantages cited by Pratt after putting the new electrode into service. With the old E8016 type, only the shop's most experienced weldor was qualified to work on the valves and, according to the shop foreman, "he usually had to spend a day or two at home recuperating from fumes and heat."

Weld Metal Savings

With the advent of the new E8016 electrode type, Pratt kept a close account of deposited weld metal. This record indicates that 360 lb of the new electrodes were required to complete a 66-in. valve.

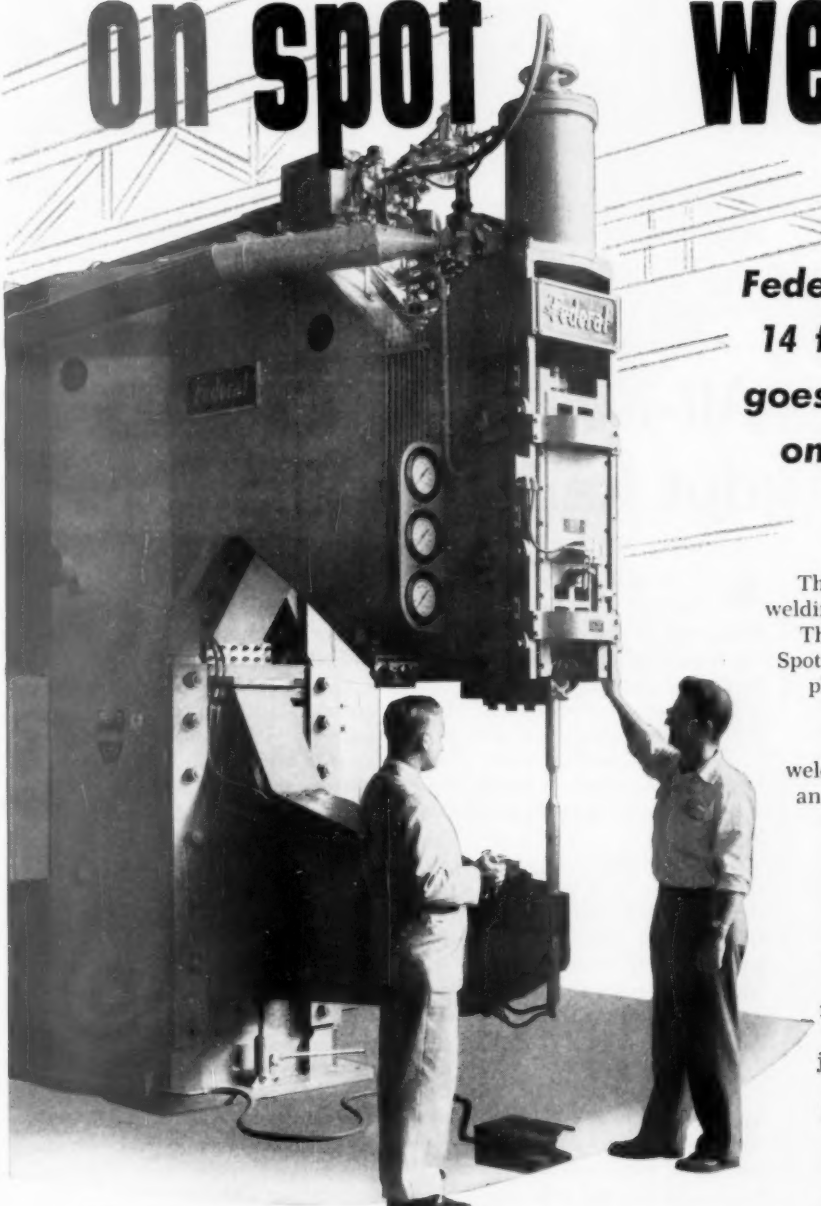
No performance figures for the old electrode were available, but a conservative estimate by weldors and supervisors placed its consumption on the same job at double that of the low-hydrogen, iron-powder electrode.

Great savings in time have also been effected because: *(1)* the new electrode deposits metal at a rate greatly exceeding that of its predecessor (with no apparent porosity or cracking) and *(2)* many preliminary and post-weld manual operations have been eliminated.

—Photos courtesy Alloy Rods Co.

COMPLETED 66-in. valve body (bottom) was fabricated entirely with low-hydrogen, iron-powder electrodes. End flanges are 3⅛ in. thick and external ribs are 2½ in. thick and 6 in. wide.

...the BIGGEST story on spot welding!



Welding engineers testing record setting spot welder. Federal has been commissioned to build several more of these giants for aircraft manufacture.

Federal Built 14 ft., 28 ton giant goes into operation on west coast . . .

The biggest thing in aircraft spot welding—that's the huge new Federal Three Phase Frequency Converter Spot Welder designed to make spec plus welds on the tail section of a new commercial jet airliner.

More than 13 feet tall, the big welder weighs over 58,000 pounds, and has a special throat, or work clearance area, of some 2500 square inches.

The design and manufacture of the 12 ton unipolar transformer having an output in excess of 100,000 amperes and the requirements of meeting rigid deflection specifications on this large throat machine were just a few of the new problems encountered on this project. Federal experience and facilities once more provided the correct solutions.

Here again, is proof that large or small—standard or special—*Federal Stays First in Resistance Welding.*

Federal WELDERS®

Warco PRESSES®

The Federal Machine and Welder Co.

WARREN, OHIO

80

FOR
RADIOGRAPHS
WITH
SHARP
DETAIL
AND
CONTRAST

USE MITCHELL (MS SERIES)

Portable

INDUSTRIAL X-RAY EQUIPMENT

MS140—MS200—MS260—MS300

You can get important information on and inspect critically the internal arrangement of castings, welds and assemblies with MITCHELL MS Series, portable X-ray equipment. Compact MITCHELL units offer the highest possible degree of accuracy, radiographs of sharp detail and contrast and these outstanding advantages:

1. **Easy Positioning in any location,** in any direction
2. **Long Service Life** because the best quality American made instruments and electronic devices are included in the control
3. **Full Protection** against mechanical and electrical failures
4. **Use With Most Voltages** encountered in industrial plants.
5. **Rugged, Waterproof, Shockproof, Dustproof construction**
6. **Smallest Possible Focal Spot X-Ray Tubes**
7. **Easy Operation.** Relatively inexperienced personnel can operate MITCHELL X-ray units
8. **Illumination of Difficult Access Places** through an extension light which plugs into the head assembly or control

You can improve products, repair serious damage or make other advantageous applications of the information only the MITCHELL MS Series provides. Get details today on this important equipment. Write, wire or call

Mitchell

RADIATION PRODUCTS CORP.

128 E. Washington Street Norristown, Pa.
BRoadway 5-7962

—*Courtesy The Lincoln Electric Co.*

SERVING as model for many bridges on new Kansas Turnpike, all-welded, continuous plate girder bridge stands near Florence, Kan.

All-welded bridges dot Kansas Turnpike

WELDED designs can be found in many of the 256 bridges and overpasses on the new 236-mile Kansas Turnpike which was opened to traffic in October.

Since construction of this state's first all-welded, continuous plate girder bridge near Florence, Kansas, several years ago, hundreds of similar structures have been erected on the state's highways.

The first welded plate girder bridge, which serves as a model for today's structures, was designed by W. R. Chalmers for H-20 loading (640 lb per linear ft) in conformance with 1944 specifications of the American Association of State Highway Officials.

Skip-Welded Plates

It is a four-span unit (two 84-ft lengths and two 108-foot lengths) with main girders 48 in. deep. Webs are $\frac{3}{8}$-in. plate and flanges are 12 by $1\frac{1}{8}$ in., except over piers where they flare out to 22 in. in width.

This tapering flange (shown in the illustration above) permits fabrication of a girder with uniform depth, obtaining the necessary increase in section at the pier support by horizontal flaring of the flange.

Girders on the first bridge were shop-fabricated by the metallic arc process, with stiffener plates skip welded to webs and flanges.

Current practice is to omit outside stiffeners or fascia girder webs in the interests of appearance and steel savings. Transverse and diagonal bracing angles are now arc welded to stiffeners in the field to tie the structure together.

Service Plazas

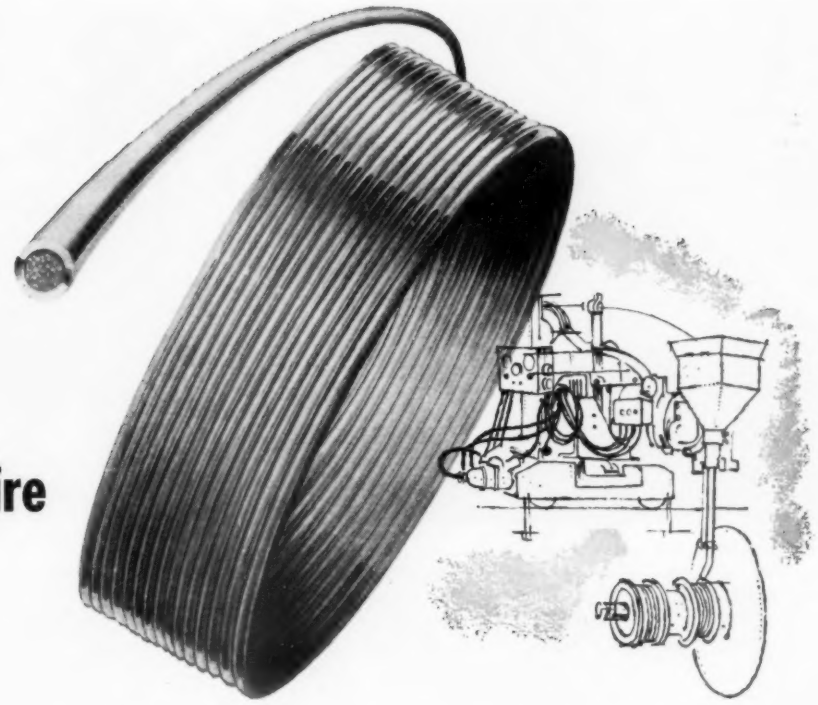
The new Kansas Turnpike has two 24-ft traffic lanes, with surfaced shoulder strips 10 ft wide on the inside, 4 ft on the outside. Lanes are separated by a depressed, 20-ft median strip.

Six service plazas along the route from Kansas City to Lawrence, Topeka, Emporia, El Dorado, Wichita, and the Oklahoma border are situated between traffic lanes which veer out at these locations.

Considerable flexibility was effected in overall construction of the project; better access and turn-around facilities were also provided. The road, costing $160 million, was financed by revenue bonds which are calculated to be paid off in 19 years.

HAYNES
Trade-Mark

Drawn Tube Wire for . . .



TROUBLE-FREE MECHANIZED HARD-FACING

HAYNES drawn tube wire is an important innovation in the hard-facing field and is designed to make automatic and semi-automatic deposition even more practical. It successfully combines the uniformity of composition and the economy offered by tube rod, with the ease of application of solid welding wire. In addition, standard wire tolerances for roundness and concentricity are strictly adhered to in order to insure trouble-free application. HAYNES drawn tube wire feeds smoothly and uniformly in any standard welding machine without the aid of special adaptors. Kinks and twists which sometimes hamper tube rod deposition are minimized. Deposits of this newly developed product are dense and sound.

Coils of drawn tube wire are now available in the following alloys: HAYNES 90, HAYNES 93, HAYNES 4560, HAYNES 5260, HASCROME, and HAYNES Nickel-Manganese. The variety of properties offered by these iron-base alloys insures a solution to a great many wear problems encountered in practically every industry and especially in the mining and construction fields. Drawn tube wire comes in 3/16 inch diameters only.

For more information on the complete line of HAYNES tube rods in coils or on any of the 19 HAYNES hard-facing alloys, write to any of the district offices listed below.

HAYNES
TRADE-MARK
ALLOYS

HAYNES STELLITE COMPANY
A Division of Union Carbide and Carbon Corporation
UCC
General Offices and Works: Kokomo, Indiana
Sales Offices
Chicago • Cleveland • Detroit • Houston • Los Angeles • New York • San Francisco • Tulsa

The terms "Haynes" and "Hascrome" are registered trade-marks of Union Carbide and Carbon Corporation.

ALEXANDER Memorial Stadium contains 32 elliptical ribs, fabricated by welding, connected to welded ring. There are 125 lb of welding rod in each rib, and 225 lb in top ring.

Stadium ribs stand without a spine

CONSTRUCTION of the $1.5-million, dome-shaped Alexander Memorial Stadium in Atlanta, Ga., aroused comment and curiosity because of the building's unusual design and appearance.

The stadium contains 32 elliptical ribs, fabricated by welding, each of which spans 130 ft from hinged foundations. Ribs are connected to an all-welded ring—key member of the entire structure. Construction was handled by Calvert Iron Works, Inc., Atlanta.

For construction details of a similar structure, see "Charlotte completes its welded coliseum," WELDING ENGINEER, September, 1956, page 56.

The Atlanta structure, consisting of the stadium and three concession wings, is located just off the main expressway in Atlanta. Total weight of structural steel is less than 550 tons, including the wings.

Fit-Up Jig

Since it contains no interior columns, the 270-ft diameter stadium will offer visitors a completely unobstructed view of the arena. Atop the main dome is a smaller, similarly constructed dome (or cupola) 48 ft in diameter.

The 32 ribs have 5/16-in.-thick and 3/8-in.-thick web plates which vary in depth from 3 to 4½ ft. Flange plates are 16 by ¾ in. Total length of each rib is approximately 141½ ft; each weighs 22,000 lb.

Ribs are fitted in a vertical jig in two sections and tack welded. These sections are then taken out of the jig, joined with continuous fillet welds, and fitted with pairs of welded stiffeners on 4-ft centers. There is a bolted splice in each rib for fit-up purposes.

Dome Erection

Ribs are shipped to the job site in matched pairs and fitted together on a flat surface. After splices are bolted tight, the splice joint is welded and all bolts removed. The end product constitutes one complete rib of the building.

Butt welds in web plates were welded with 3/16-in. E6010 and E6012 electrodes, using a multiple-pass procedure. Plates were beveled 30 deg (60-deg included angle). Fillet welds on the ribs were made with 7/32-in. E6024 electrodes.

There are 125 lb of welding rod in each rib, and 225 lb in the top ring. All welding was done with 300-amp d-c machines.

The ring to which ribs are connected is 10½ ft in diameter, 3¾ ft deep, and weighs approximately 20,000 lb. It is completely welded, with flanges cut from 2¼-in. thick plate. The web is 1½-in.-thick plate rolled to a 5¼-ft radius.

Erection of the dome was accomplished by fabricating a center column with cross arms to support the large ring and a smaller ring above it. This support was erected at the exact center of the stadium and guyed-off in all directions.

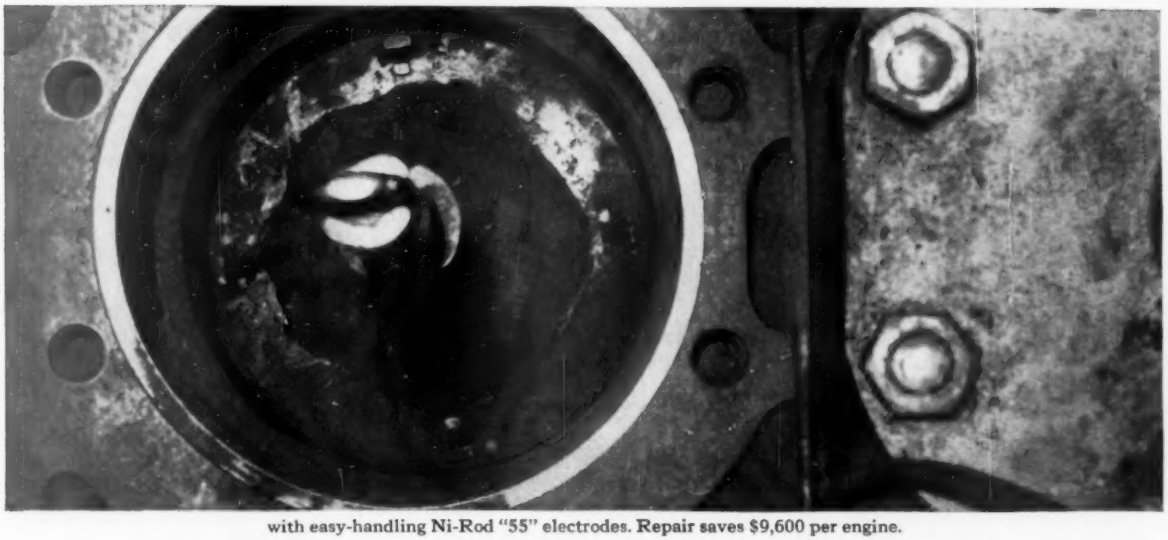
After the center column was in position and plumbed, the large ring was set on the cross arms and temporarily bolted. The first rib, lifted into position by two cranes, created a critical load situation on the center support which was rectified by other rib additions.

Center Column Removed

The bottom rib connection, to a steel shoe anchored into the grade beam with four 2-in. anchors, was made first with a 3¾-in. steel pin. The top of the rib was then bolted to the ring. An opposing rib and two

KEY member of entire structure is all-welded ring, shown here in part. Ring weighs about 20,000 lb.

Welding cast iron cylinder blocks down in the cramped engine room of a tug is routine . . .



with easy-handling Ni-Rod "55" electrodes. Repair saves $9,600 per engine.

Salvages $10,000 engine blocks by welding with Ni-Rod "55"

Down in the engine room of a diesel tug, space might seem too cramped for major repairs. But with $10,000 engine blocks at stake, Marine Industries, Ltd., had to try.

Their problem: salt water coolant corrodes through the guide ring that seals off the cylinder sleeve. Result: a $10,000 engine block is ruined.

With a fleet of tugs and tankers to maintain, Marine Industries searched for a way to repair these rings. Four years ago they found the answer:

Rebuild a corroded ring by welding with Ni-Rod "55"* electrode.

They found that Ni-Rod "55" electrode produces the strong, sound welds they need. Easy to use, Ni-Rod "55" electrode permits them to weld with the cylinder block in place. And weld deposits can be machined readily.

To date, Marine Industries has salvaged 23 blocks — a saving of nearly a quarter of a million dollars!

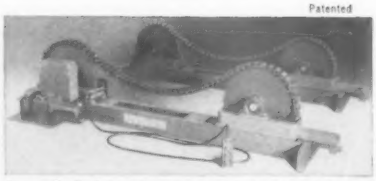
Find out more about successful welding with Ni-Rod "55" electrode. "A Handy Guide to Welding Cast Irons" gives tips on preparation, welding techniques, getting maximum machinability, and more. This illustrated booklet is yours on request.

*Registered trademark

The International Nickel Company, Inc.
67 Wall Street New York 5, N. Y.

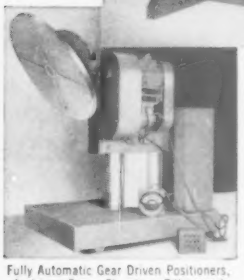
INCO TRADE MARK **Welding Products**
Electrodes • Wires • Fluxes

Aronson
Offers You Over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact Requirements

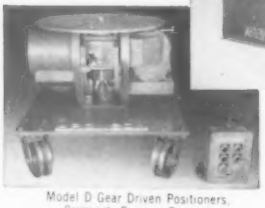
Patented

Aronson TracTred (T. M. Reg.) Turning Rolls for thin walled heavy cylindrical work to 27 tons capacity. Zero to 100 IPM turning speed and Built-In Grounding.

Heavy Duty Gear Driven Positioners, with Magnetic Braking, Mercury Grounding, and Optional Speeds. Capacities to 24,000 lbs.

Heavy Duty Precision Built Rubber and Steel Tired Turning Rolls, 100% overload protected. Capacities to 250 Tons. Also Tilting Rolls, Pipe Rolls and Rail Cars.


Fully Automatic Gear Driven Positioners, featuring Power Elevation, Tilting and Rotation. 5,000 lbs. Capacity.

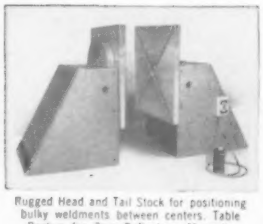
Heavy Duty Floor Turntables with precision speed control and Magnetic Braking, used for welding, burning, X-raying, etc. Capacities to 75,000 lbs., various heights and speeds.


Model D Gear Driven Positioners. Compact, Precise, Rugged. Capacities to 1000 lbs.

Bench Turntable Automatic Positioners with Mercury Grounding Capacities to 500 lbs.

Patented

Aronson Universal Balance Positioners (T.M. Reg.) position your weldments effectively, instantly for downhand welding. Capacities to 2000 lbs.


Rugged Head and Tail Stock for positioning bulky weldments between centers. Table Backup for Zero Deflection, Magnetic Braking. Capacities to 160,000 lbs.

Aronson Twinner Permanent Magnetic Clamps, six models with thousands of uses in welding set-up work. Write for bulletin.

POSITIONEERING with Aronson

POSITIONERS

UNIVERSAL BALANCE® POSITIONERS
BENCH TURNTABLE POSITIONERS
GEAR DRIVEN POSITIONERS
HEADSTOCK-TAILSTOCK POSITIONERS
TRACTRED® TURNING ROLLS
RUBBER-TIRED TURNING ROLLS
RAIL CAR POSITIONERS • TURNTABLES
FULLY AUTOMATIC POSITIONERS
MAGNETIC WELDING CLAMPS

ARONSON offers you over 200 PROVEN Standard Stock Models of Quality POSITIONERS "POSITIONEERED" to your exact requirements

Write for detailed engineering data

Quality POSITIONERS by Aronson MACHINE COMPANY
ARCADE, NEW YORK

AFTER completely welded ring was in place, ribs were hoisted and connected to it to form dome shape.

ribs at right angles were erected using the same procedure.

Each quarter-segment was then filled in to form a complete structure. As pairs of ribs were erected, fill-in trusses and purlins were put in place. Every other bay was fabricated with a view to later expansion.

After all steel was in place and connections to rings were finish welded, the center column was removed.

There was a great deal of speculation as to whether this dome would rise or settle when the center support was removed. Actually, during latter stages of erection, tie-down bolts between ring and cross arms had been removed. Consequently, the dome was free to expand and contract as the heat of the day varied.

Stadium Facilities

During this time it was noted that the ring pressed tightly against its supports in the early morning hours. However, during the middle of the day, it lifted about ¼ in. above all support and became free-standing.

The stadium has a circumference of approximately 848 ft. It is 51½ ft high from grade level to top of main dome. Playing field and seating area are below grade. The playing field is 25 ft below grade, giving an overall ceiling height of more than 71 ft at the stadium's center.

When the building is complete it will seat 7,000 persons, and provide complete athletic facilities.

—*Metallizing Engineering Co., Inc.*

FERROUS welds are being zinc metallized to protect them from corrosion. Prior to this operation, assembly is cleaned in sandblasting room.

Metallizing solves heat and rust problems

CORROSION and heat-transfer problems at Servel Inc., Evansville, Ind., are being solved by means of sprayed aluminum and zinc in various production applications.

The firm manufactures gas refrigerating units which, unlike other types, are made up of a series of steel pipes and chambers welded into a single system without moving parts. Metallizing solves the problem of rust-proofing ferrous welds.

The evaporator assembly, consisting of evaporator compartment and steel piping, comes to the metallizing operation badly oxidized. This is the result of heat applied to the unit when steel freezing coils are brazed to the evaporator shelf.

Key Operating Areas

To remove scale, the assembly is carried by conveyor to a sandblasting room for cleaning. Then, still on the conveyor, it is routed through a spray booth for zinc metallizing. Only two operators are needed for this work.

In another application, Servel solves a heat-transfer problem with sprayed aluminum.

The firm specifies that efficient heat exchange take place at key operating areas of its refrigerating units. To do this, a pipe carrying a warm solution is brought into contact with one carrying cool liquid.

Since extra surface is needed for efficient conductivity, walls of the piping where heat exchange takes place are tack welded together. The joint between pipe lengths is then built-up with sprayed aluminum to provide an effective heat-transfer bridge.

Capillary Action

Metallizing guns are also used in touch-up spraying of aluminum on evaporator coils. These steel coils are aluminum-brazed to the top and bottom of evaporator compartments.

During brazing, molten alloy flows by capillary action around the steel freezing coils. This action is desirable both for corrosion protection and good heat transfer.

In some instances, gaps are left where capillary action is not sufficient to cover the pipe completely. Such units are sent to another spray booth where voids are filled-in with sprayed aluminum.

SPRAYED aluminum is used to fill in voids left where capillary action is not sufficient to cover pipe completely.

YOUR BEST MOVE... MOVE
with MERRILL
MATERIAL
HANDLING
DEVICES

4
SIZES

LIFTING
CLAMP

TWIN LIFTER

DRUM LIFTER

DRUM TILTER

HAND GRIP

DRUM OPENER

For Interesting Information write

MERRILL BROTHERS

56-81 Arnold Ave., Maspeth, N. Y.

3-R-6

new products . . . Card on page 107

SIDE-MOUNTED control, gun with locating plates, are for Mig spot, tack welding.

Spot welding

SEMIAUTOMATIC spot and tack welding accessory is for use with models of Mig (metal inert-gas) wire drive unit. Available in kit form or factory-installed accessory. Set consists of gun adaptor kit and control. Gun kit includes locating plates for butt corner and fillet welds. Can be adapted for other configurations.

Controls are mounted permanently on steel door that replaces standard door on wire drive unit. Gun adaptor kit consists of screw-on nozzle and two sets of locating plates for three basic weld positions. Also furnished are protective plates so that operator does not need to wear a protective helmet or glasses.

Control is a timer which can be set for welding times of 8-360 cycles; on-off switch for timer; slow-fast switch for speed with which wire drive is started. With slow start setting, striking of the arc immediately brings wire drive to normal speed. This feature can be used whether or not spot welding attachment is in use, states the manufacturer. *General Electric Co.*

Circle No. 1.

Cast iron electrode

MACHINABLE cast iron electrode has flux coating on 55-60% nickel alloy. It is recommended for welding high phosphorus irons, work requiring high strength in weld area and for welding heavy sections. This includes repair of cylinder heads and blocks, machine bases, equipment parts.

Designated "No. 8-60," the electrode is said to have higher strength and better elongation than 99% nickel rods. It is applicable with either a-c or d-c reverse polarity and at amperages from 40-180. No preheating is required, states the manufacturer. Sizes are 3/32, 1/8, 5/32 and 3/16 in. Standard packages are 5 lb, 10 to carton. *All-State Welding Alloys Co., Inc.*

Circle No. 2.

Electrode holder

ELECTRODE holder has low trigger for fast one-hand rod release. Other features are tip insulation which shields hinge pin from spatter, completely enclosed spring can't be knocked out, all parts interchangeable, finest insulation withstands higher temperatures longer, grips which will not warp or absorb moisture, states manufacturer. Available in three weights and ranges from 200-500 amp. *Miller Electric Mfg. Co.*

Circle No. 3.

Plant, Research Laboratories and World Headquarters

BETTER ORIGINAL FASTER
Low Temperature EUTECTIC WELDING ALLOYS
STRONGER WELDS

EUTECTIC Welding News

PUBLISHED BY EUTECTIC WELDING ALLOYS CORPORATION, 40-40 172 STREET, FLUSHING 58, NEW YORK, N. Y.

"EUTECTIC" WELDING HEADLINES • TIME-MONEY-MACHINERY SAVERS

EUTEC-CHAMFERTRODE REMOVES "FATIGUED" METAL FASTER

By using Eutec-ChamferTrode and Eutec-CutTrode, an Oklahoma hydro-electric plant avoided time-consuming grinding away of "fatigued metal" and accomplished the quick repair of a turbine bucket with great savings in "downtime" and labor.

The bucket, part of a 57-ton turbine, was in danger of cracking because of fatigued metal formation. The bucket's inaccessibility prevented the use of grinding equipment to remove the fatigued metal before welding on stainless steel plates. Eutectic's District Engineer recommended Eutec-ChamferTrode and Eutec-CutTrode, high speed electrodes for gouging, chamfering, and piercing all metals, without the use of oxygen or extensive equipment.

(Fig. A)

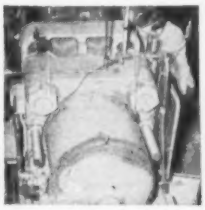
First, the fatigued area was marked off and an outline cut with Eutec-CutTrode. Weldors then gouged out the defective metal with Eutec-ChamferTrode (Fig. A). Gouging was accomplished far more quickly with ChamferTrode than would have been possible with any mechanical grinding equipment. ChamferTrode's special exothermic coating concentrates the force of the arc right at the point of application, producing a highly efficient metal removing tool.

(Fig. B)

Stainless steel plates were then tacked on with EutecTrode 680 AC-DC, an all purpose, high tensile, corrosion resistant electrode for very high alloy and carbon steels. Repair was completed by welding again with EutecTrode 680 AC-DC, which produced a smooth, porosity free weld of perfect density (Fig. B). The weld was deposited at the highest possible speed. Welding was done at lowest possible amperage and no warping occurred. Finished weld has exhibited high strength and wear. *(A-30)*

EUTECTRODE 680 AC-DC WITHSTANDS 1500 PSI

EutecTrode 680 AC-DC has again demonstrated its high tensile strength in repairing the hydraulic compression chamber of an injection molding machine. An eastern manufacturer had tried unsuccessfully to repair the compression chamber, made of cast steel, with conventional high heat welding materials. These welds all cracked under the stress of 1500 psi pressure in the compression chamber.



Before replacing the compression chamber, at a cost of $4200, the manufacturer called in a Eutectic District Engineer. He suggested EutecTrode 680 AC-DC, all purpose, high tensile electrode for very high alloy and carbon steels. Welds of EutecTrode 680 AC-DC were deposited at high speed and at lowest possible amperage settings. The manufacturer discovered that EutecTrode 680 AC-DC gave a smoother, denser weld, free from porosities and undercutting. In operation, the weld has combined high tensile strength with sufficient elongation to absorb compression chamber stress without cracking. The ultimate tensile strength of EutecTrode 680 AC-DC is 120,000 psi. *(A-33)*

CAST IRON WELD SAVES $6,000, FOUR MONTHS "DOWNTIME"

By using EutecRod 1804 to repair a 50 HP motor which had eight cracked fins at the end of its armature, a New England aircraft plant saved $6000. This was the cost for removing the motor from the plant, repairing it, and re-installing it.

Company officials consulted Eutectic's District Engineer. He suggested repair with EutecRod 1804, a copper base, silver bearing, thin flowing alloy that produces high strength joints on close fitting operations. Using 15 lbs of EutecRod 1804, a weldor repaired the armature fins in less than six hours. Welds have shown excellent wear and conductivity. EutecRod 1804 does not require fusion of the base metal; its ultimate tensile strength is up to 50,000 psi. *(A-34)*

WELDING MACHINE BASE WITHOUT DISMANTLING SAVES $3200

Use of Eutec-ChamferTrode and Eutectic "Low Temperature Welding Alloys" to repair the heavy base casting on a planer without dismantling it from the planer saved an Idaho lumber company $3200 and four months "downtime." To replace the base casting, which cost $1200, the entire planer would have to be shipped to its East Coast manufacturer. This would have cost $2000 in railroad fares and kept the planer out of production for four months.

Eutec-ChamferTrode was used to give a right angle chamfer to all broken edges on the casting. The weldor then applied a dense, smooth weld of EutecTrode 27, a high strength, ferrous electrode for all cast iron repairs where machinability is not desired. The base casting was re-welded with Xyron 2-24, which permits "cold" cast iron welding from all positions without dismantling heavy sections. Xyron 2-24's "Frigid Arc" coating produced a dense, machinable weld, free from cracks and stress formations. Weldors have found that Xyron 2-24 gives very close color match and permits great ease of application. *(A-31)*

EUTECROD 16FC LOWERS FINISHING COSTS

Warping and uneven welds caused by conventional high heat welding materials led a manufacturer of calculating machine carriage shells to try EutecRod 16FC, a

highest strength, "brazing type" alloy for joining steel and other metals. Precision standards for the carriage shells made warped parts unacceptable. Further finishing of uneven welds was an added cost to the manufacturer.

Use of EutecRod 16FC has resulted in lowered finishing costs and stronger welds. Great capillarity of EutecRod 16FC makes it ideal for thin forming operation required in welding carriage shells. EutecRod16FC produces a smooth, porosity free weld requiring no further extensive finishing. It is applied at the lowest possible temperature without fusion of the base metal. No warping occurs. Ultimate tensile strength is up to 100,000 psi. *(A-32)*

Eutectic Welding Alloys Corporation
40-40 172nd Street, Flushing 58, N.Y.

Gentlemen:

I would like further free information on the following:

☐ A-30 ☐ A-31 ☐ A-32
☐ A-33 ☐ A-34
☐ **Free 170 page pocket Welding Data Book.**

Name_____

Address_____

City_____ State_____

When welded aluminum must meet exacting standards...severe service

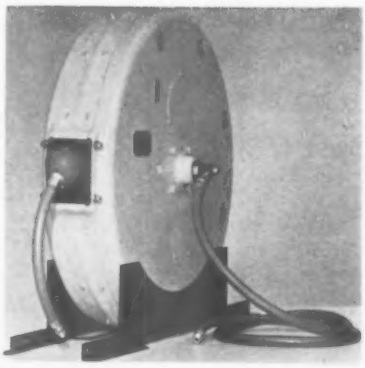
Photo Courtesy of
Graver Tank and Mfg. Co., Inc.

WELD WITH ARCOS

ALUMINUM RODS and ELECTRODES

The inert-gas-shielded-arc process made aluminum welding practical . . . but it takes Arcos quality in aluminum bare wire to assure you the most dependable results possible. Because no flux is used, the chemical analysis and cleanliness of the wire must be within exacting limits. Arcos' long experience with weld metallurgy, plus rigid controls in manufacturing, guarantee this vital factor. Arcos aluminum wire is your best assurance of stronger, more ductile, more corrosion-resistant welds.

ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.



Single hose reel

SPRING retracted single hose reel features steel shaft rotating on ball bearings. Newly designed swivel uses Chevron type seals, with sintered bronze graphite bearings in stainless steel spindle. Clock type motor spring provides required power.

Model "A-1 Weldreel" has adjustable mounting brackets for installation in several positions. Pawl locks hose at any desired length until released by slight tug on hose. Shipped with 5 ft of inlet hose. Reel is available with 50 ft of ¼ in. ID hose, 50 ft of ⅜ in. ID hose or 30 ft of ½ in. ID hose, all with female NPT fittings. Unit is 27 in. long with brackets, 21 in. high and 10 in. wide. Weighs 70 lb. Will be exhibited at the 8th Plant Maintenance & Engineering Show, Cleveland, January 28-31. *United Specialties, Inc.*

Circle No. 4.

Rectifier welder

SILICON rectifier welder has wide-amp control for wide current range. The "Arc-drive" control enables operator to adjust characteristics to the job. Welder has weatherproof construction, thermal-magnetic overload protection—core and coils double-dipped and double-baked in silicon fortified Bondite. Rectifier units are enclosed in copper capsule, hermetically-sealed against dust, oil, water and acid fumes. It is said to provide easy starting, good arc stability, maximum drive. *Westinghouse Electric Corp.*

Circle No. 5.

Abrasive

LATEST addition to line of aluminum oxide abrasives is produced by electric furnace process. Termed "44 Alundum," it is claimed to have toughness, high inherent strength, fine crystal structure and sharpness. Can be used in wide variety of grinding operations. *Norton Co.*

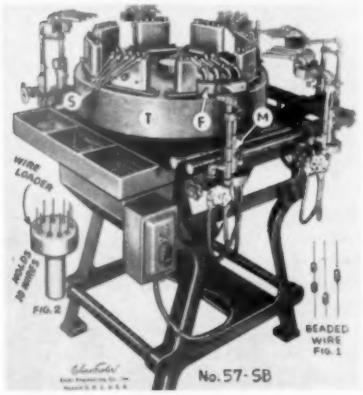
Circle No. 6.

Pipe marker

SMALL, lightweight "Ayres" pipe marker can draw a clean perfect line on any pipe, large or small, thick or thin, at any angle. Weldor does not have to bevel pipe when using this instrument, states the manufacturer. It compensates automatically for the thickness of the pipe wall.

Templates are seldom needed but can be made very easily. With aid of this pipe marker, tubing can be used more extensively. Three sizes are available for ¾-3 in.; 2-8 in.; 8-24 in. pipe. *Ayres Pipe Marker.*

Circle No. 7.



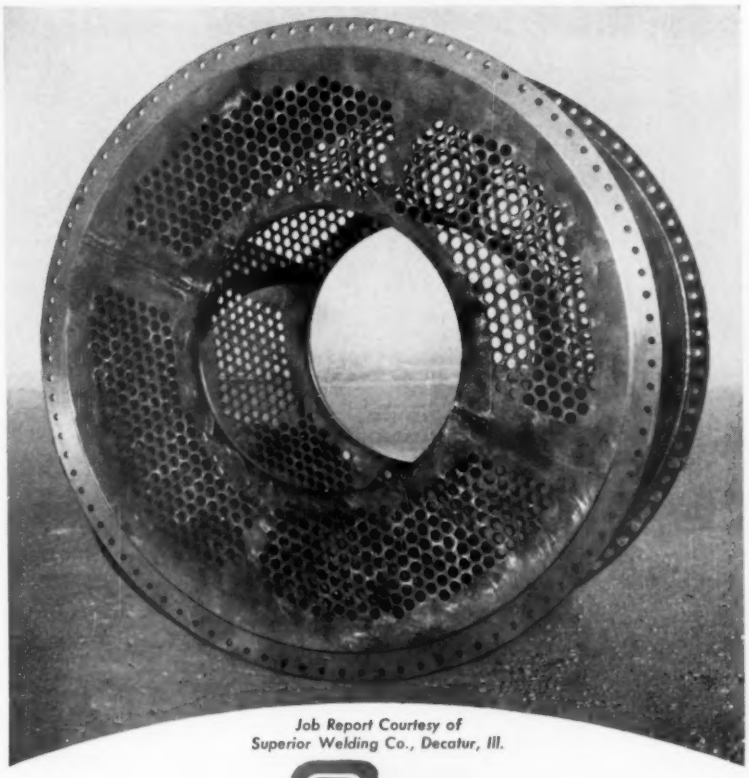
Indexing unit

MACHINE is for melting glass beads onto wire. Can be used for annealing, brazing, flame-hardening, spraying and operations where rotating and indexing are important. Can be used in construction of diodes and other electronic devices.

Unit has 8 stations. A turret indexes intermittently by means of gear located on underside of the turret. Each station consists of a nest of 5 rotating spindles. Each spindle accommodates 5 wires in the beading operation. This combination has a productivity of 25,000 wires per hour when machine operates at speed of 500 indexes per hour. *Eisler Engineering Co., Inc.*

Circle No. 8.

How to get trouble-free service from welded stainless equipment



Job Report Courtesy of Superior Welding Co., Decatur, Ill.

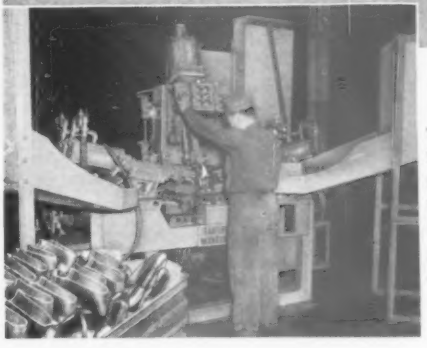
WELD WITH ARCOS

STAINLESS ELECTRODES

This heater or calandria section of a finish evaporator used in the food and chemical industries is made of Type 316 stainless plate. Equipment such as this must resist the corrosive attack of the acids in the liquids being processed. ARCOS Chromend KMo (Type 316) Electrodes were selected because of their known ability to produce sound weld metal that defies the destructive action of sulphuric, acetic, and similar organic acids. For trouble-free weld metal—easily deposited—use ARCOS Electrodes.

ARCOS CORPORATION, 1500 S. 50th St., Philadelphia 43, Pa.

1 specially-tooled T-W welder assembles 15 bumper guards



This custom-built projection welder assembles 15 different models of auto bumper guards at a rate of 300 per hour. One or two mounting brackets are projection-welded on both sides of each guard. Simplified tooling changeover has cut down time 50%.

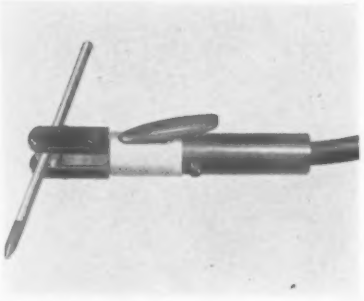
Specially-designed resistance welders speed assembly of many products that are similar — yet different. Custom tooling provides the answer. Designed for rapid changeover, special tooling reduces down time and lowers unit cost. It also permits economical modification for producing redesigned models. The result is a savings in capital investment and operating costs. For information on reducing your assembly costs now — and year after year, call the nearest Taylor-Winfield office, listed below.

The TAYLOR·WINFIELD *Corporation*
WARREN, OHIO

ELECTRIC RESISTANCE AND ARC WELDING MACHINES

Sales and Service

CHARLOTTE • CHATTANOOGA • CHICAGO • CLEVELAND • DALLAS
DAYTON • DENVER • DETROIT • LOS ANGELES • PHILADELPHIA
PORTLAND, OREGON • SEATTLE • ST. LOUIS • STAMFORD
OAKVILLE AND WINDSOR, ONTARIO



Cutting torch

REDESIGNED "H-3" cutting and gouging torch is short and compact. It is also insulated and will stand up better than present "G-3" model, states manufacturer. Basic operation features have been retained, including rotating head and concentric cable.

New features include: heat, impact resistant moulded plastic insulators; push-button air valve; glass laminate sleeve to protect handle from burning; moulded upper arm handle which fits hand; cable connection inside handle, which moves cable flexure away from connection; insulating rubber boot on connection to welding lead, which insulates connection and can be opened for changing connection.

Torch uses only an electric arc and compressed air, cuts, gouges, grooves or bevels any metal quickly and cleanly, it is reported. *Arcair Co.*

Circle No. 9.

Spot welder

REACHING over 13½ ft in the air and weighing over 58,000 lb, three-phase, frequency converter spot welder is claimed to be the largest resistance spot welding machine of this type ever built.

It is designed with a special throat or work clearance area of approximately 2,100 sq in. to accommodate a portion of the tail section of the large commercial jet airliner. Three-phase unipolar transformer supplies 100,000 amp of welding current. It is also reported to be the largest of this type ever constructed. It weighs over 25,000 lb. This welder is one of several duplicate units presently being manufactured. *The Federal Machine & Welder Co.*

Circle No. 10.

Steel tubing

WELDED steel tubing is now available in sizes to 5 in. OD and wall thicknesses from 0.065 to 0.250 in. The addition of 5-in. tubing gives range of sizes from ¼ in. to new maximum, with wall thicknesses from 0.028 to 0.250 in. *Revere Copper & Brass Inc.*

Circle No. 11.

WELDED BY

John Inglis Co.

TORONTO, ONT., CANADA

Important heavy equipment like this for the St. Lawrence Seaway Power Project, must meet the highest engineering and construction standards. Sixteen complete English Electric turbines, each including these large speed rings, discharge rings and draft tube cones now under construction by the John Inglis Co., Toronto, are being welded with Atom • Arc 7016 iron powder low hydrogen electrodes.* Like other heavy industrial fabricators who insist on the best, John Inglis chose Atom • Arc electrodes for this Seaway equipment, because of their essential advantages of highest physical properties, X-ray quality weld metal and high deposition rates. Atom • Arc electrodes also largely eliminate the necessity for preheating before welding such heavy steel sections.

Atom • Arc iron powder, low hydrogen electrodes have become standard on many structural and fabricated equipment welding operations. Find out why Atom • Arc is the first choice of leading industrial fabricators—write today for complete information.

Alloy Rods Co.

General Offices and Plant
Lincoln Highway West
YORK 2, PENNSYLVANIA

Pacific Coast Sales
Office and Plant
750 Lairport Street
EL SEGUNDO, CALIF.

no finer electrodes made . . . anywhere

ATOM • ARC is sold in Canada by Canadian LIQUID AIR Company, Ltd.

NEW IMPROVED HARD FACING

Tough, hard ceramic coatings provide superior bearing surfaces

Sprayed alumina forms "sapphire-hard" surfaces highly resistant to wear, abrasion and corrosion. Ideal for bearing surfaces, seals.

Development of the new METCO THERMOSPRAY GUN for spraying high-melting-point ceramic materials at low cost opens up a variety of new practical applications. One that has produced a great deal of interest is the use of sprayed alumina coatings for bearing surfaces and mechanical seals. This THERMOSPRAY 101 Ceramic Powder produces surfaces with a hardness of 9.0 on the Moh scale, (only the diamond rates 10.0) with excellent resistance to wear, abrasion and corrosion. When used in combination with special phenolic or furane plastic sealers it provides superior protection against many acids.

Another THERMOSPRAY Powder – 201 – is zirconia which is somewhat softer than No. 101 but provides superior heat-insulating properties. Melting point of this material is 4600° F. and particle hardness 8.0 on the Moh scale.

Hard-facing alloys of the self-fluxing, nickel-boron-silicon type in powder form can also be applied with the METCO Type P THERMOSPRAY GUN. These coatings may be fused, semi-fused, or left unfused depending on the hardness desired, from RC 30 to RC 65, depending on the alloy and the process used.

The new THERMOSPRAY GUN operates without compressed air, only oxygen and acetylene being required. The free-flowing THERMOSPRAY powders are fed to the flame nozzle from a hopper atop the gun, melted and propelled to the surface to be coated. These materials are sprayed many times faster (up to 15 sq. ft. per hour – .010" thick) than has been possible with equipment previously available. Deposit efficiencies are in excess of 95%. These factors result in extremely low coating costs.

Preliminary engineering data contained in Bulletin 127 covers ceramic coatings while Bulletin 126 covers the hard-facing alloys. Either or both may be obtained by filling out the coupon below or writing on your company's letterhead. No obligation, of course.

Pump rod sprayed with alumina provides superior protection against abrasion and corrosion.

free bulletins
(See last paragraph above)

The following trade names are the property of Metallizing Engineering Co., Inc. METCO®, THERMOSPRAY. °Reg. U.S. Pat. Off.

METCO®

Metallizing Engineering Co., Inc.
1127 Prospect Ave., Westbury, L. I., New York

Please send me ☐ free Bulletin 127 (ceramic coatings)
☐ free Bulletin 126 (hard-facing).

Name

Title Company

Address

City Zone State

Arc control

ADDITION of arc characteristic control to constant voltage welders makes it possible to select quality of arc best suited to welding job. Control of arc characteristics is done by tapped phase-shifting device.

Principal advantage of control is that it permits greater range of current density with given electrode. Control of current density is especially useful when welding aluminum, stainless steel and nonferrous alloys. On inert gas welding, especially on light gage materials with small electrodes, such control will reportedly make possible heretofore impossible welds.

On the 300-amp model, a five-position rotary switch is provided on front panel for the arc control. Position one bypasses control and welder operates as standard constant voltage unit. Succeeding positions provide arc stabilization at decreasing current loads. This allows operator to select characteristics best for job.

Operation of larger models is similar except setting for operating characteristics is done by changing jumpers on panel inside housing. Volt-amp curves for each setting are included in instructions furnished with each machine.

The control is said to be useful on round-about seam welding, heavypass welds and wherever relatively large fluid puddle is desired. It is also said to smooth out submerged arc and open semiautomatic welding on steel. *Metal & Thermit Corp.*

Circle No. 12.

Brazing rings

BRAZING rings are prefabricated. Are for use with stainless steel tubular assemblies. The "Nicrobraz" rings are available in alloy grades to suit any need and can be made for use with standard or special tube sizes or shapes. Rings are designed to slip over tube to be brazed. *Wall Colmonoy*

Circle No. 13.

You get faster "burn off"

with P&H high speed **Iron Powder** electrodes

P&H IRON POWDER electrodes with their faster deposition rates enable you to cut costs by reducing welding time. Weldors find it easy to make excellent welds by simply dragging the rod. Welds are X-ray quality, practically self-cleaning, with excellent bead appearance and exceptionally low spatter.

Write for Bulletin R-29, "P&H Smootharc Welding Electrodes" which gives full description and specification data. Address: Bill Stephens, Sales Manager, Welding Division, Harnischfeger Corp., Milwaukee 46, Wisconsin.

HARNISCHFEGER

P&H WELDERS · ELECTRODES · POSITIONERS

Milwaukee 46, Wisconsin

Ignitron

IGNITRON, "Size E," is for resistance welding control applications. Designated "NL-1054," it is a mercury pool, metal construction, ignitron capable of controlling high peak currents. It is water cooled with an internal cooling coil. Ratings for two tubes connected in inverse parallel:

Anode volts 250-500 at 50 to 60 cycles; maximum demand 4,800 kva. with corresponding maximum average anode current per tube of 486 amp d-c; maximum average anode current per tube 900 amp d-c, with corresponding maximum demand of 1,600 kva; maximum averaging time 8.9 sec at 500 volts and 17.8 sec at 250 volts; cooling requirement at full load 6 cpm. *National Electronics, Inc.*

Circle No. 14.

Anti-spatter compound

ARC weld anti-spatter is a silicone-containing emulsion. Applied to the spatter area before arc welding, "X-7" forms a thin protective coat over the weld metal. This invisible coat prevents molten spatter from sticking.

The compound is nontoxic, odorless and non-flammable. It can be used on any metal without affecting weld quality, states the manufacturer. By using a cloth, brush, or fog spray, compound can be applied any time up to weeks before welding. In most cases, no special post treatment is required where weld surface is to be painted. *Linde Air Products Co.*

Circle No. 15.

Arc welder

TRANSFORMER type a-c welder is for operation on single phase, 60 cycle, 230 volt input. Transformer is "Diverter Path" type with magnetic control. The controls provide five main steps of coarse adjustment for use in conventional a-c welding, as well as for certain inert gas welding applications.

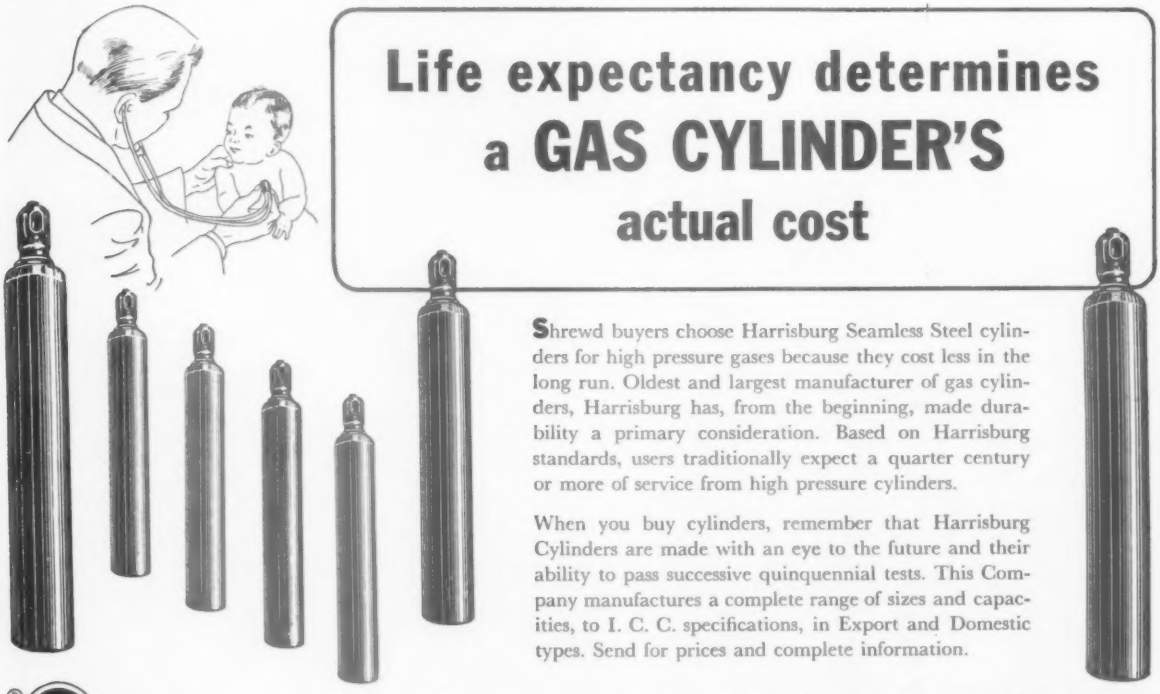
Four additional steps are for use in certain other inert gas welding; also usable for conventional welding, but only with E6013 type electrodes and only for downhand welding. A rheostat in the center of 5-range wheel operates in each step to provide fine adjustment of the arc. Welder is available with or without capacitors for power factor correction. Stationary unit is 34⅜ in. high, 19 in. wide, 18¾ in. deep; net weight is 215 lb. Portable mountings are optional. *Hobart Bros. Co.*

Circle No. 16.

End-welded stud

THREADED end welding stud is said to have improved welding qualities and increased strength. Designated type "CP," the new granular-fluxed stud can utilize templates now being used with "MG" studs up to and including ½ in. diameter. Ceramic ferrules used in welding have identical outside dimensions. Type "CP" stud is available in ¼—⅝ in. diameters. *Nelson Stud Welding Div.*

Circle No. 17.



Life expectancy determines a GAS CYLINDER'S actual cost

Shrewd buyers choose Harrisburg Seamless Steel cylinders for high pressure gases because they cost less in the long run. Oldest and largest manufacturer of gas cylinders, Harrisburg has, from the beginning, made durability a primary consideration. Based on Harrisburg standards, users traditionally expect a quarter century or more of service from high pressure cylinders.

When you buy cylinders, remember that Harrisburg Cylinders are made with an eye to the future and their ability to pass successive quinquennial tests. This Company manufactures a complete range of sizes and capacities, to I. C. C. specifications, in Export and Domestic types. Send for prices and complete information.

More than a century in Harrisburg

Harrisburg Steel Co. { Division of HARSCO CORPORATION }

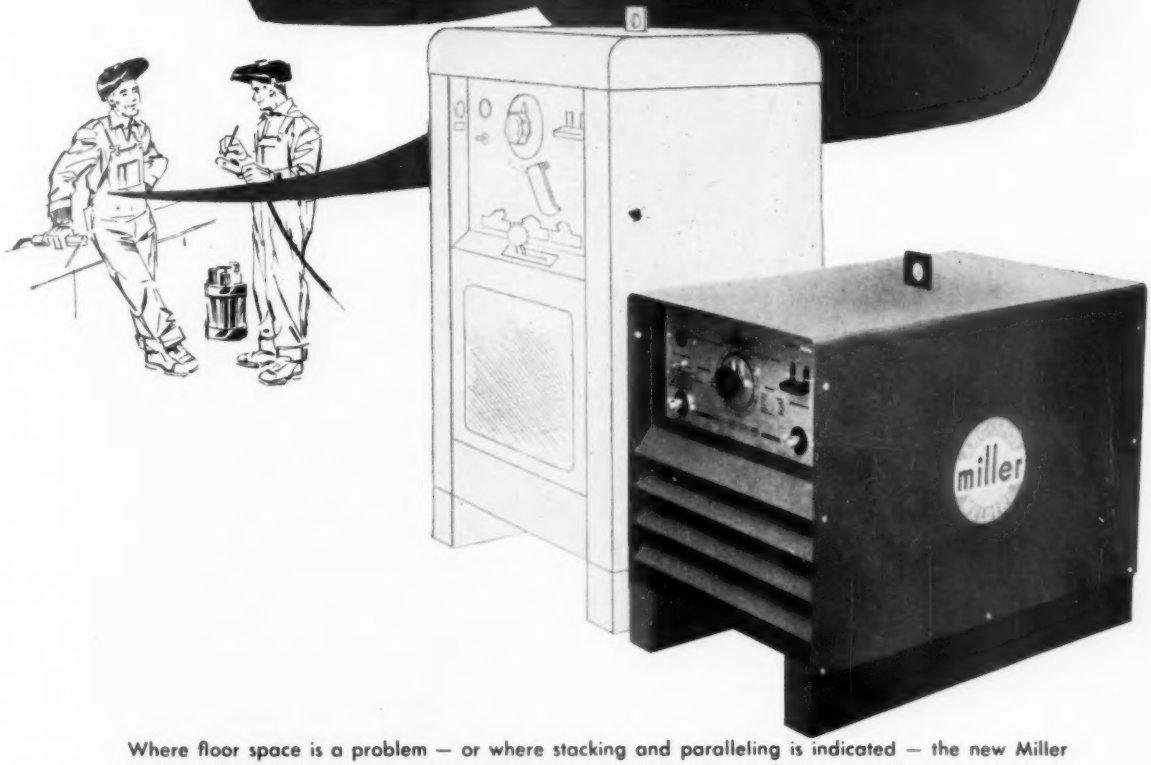
Send for literature and prices, specifying with or without caps and valves.

Harrisburg 8, Pennsylvania

say,

see the new

miller *SRH low-boy?*



Where floor space is a problem — or where stacking and paralleling is indicated — the new Miller SRH LOWBOY is the engineered-to-your-needs answer! This dc rectifier type welder is available in three models with 60% duty ratings of 200, 300 and 400 amperes. Combining compactness with quiet operation, minimum arc blow, top electrical efficiency and waterproof construction, the LOW-BOY is *another* Miller first that "figures."

Upright SR models to 600 amperes at 40 volts with 750 amperes maximum output; Duplex units up to 1200 amperes, 40 volts, 1500 amperes maximum.

". . . if it's MILLER you know it's the finest . . ."

New

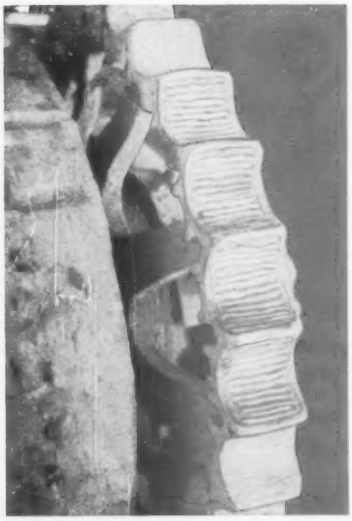
MILLER ARCWELD welding electrodes are worthy of the MILLER name and reputation. Ask your distributor for some . . . you'll like the job they do.

miller

ELECTRIC MANUFACTURING CO., INC.

APPLETON, WISCONSIN

Distributed in Canada by
Canadian Liquid Air Co., Ltd.,
Montreal, P.Q.



INTERMITTENT PASS used in hardsurfacing sprocket reduces rebuilding time and alleviates grinding by sand and mud.

TRACTOR IDLER shows herring-bone pattern of hardsurfacing created by intermittent pass. Grind and wear is reduced by this method.

Welder develops hardsurfacing shortcut using RANITE and intermittent pass

IN LOOKING for a more economical and quicker way to hardsurface tractor sprockets and idlers, Welding Foreman Art Powell of the L. E. Webb Construction Co., Inc., Santa Maria, Calif., hit on the idea of applying Ranite metallic coated hardsurfacing materials with an intermittent pass. In using this technique Powell lays down alternating beads with a gap between.

After trying other methods, Powell found this combination required less rebuilding time and at the same time effected a substantial dollar saving on each job.

Tractors of the Webb Construction Co. operate in both loose sand and mud with parts subject to continual heavy abrasion. When an intermittent pass is used on sprockets and idlers, resulting gaps formed between beads provide escape channels for the sand and mud, reducing grind and wear on these parts.

ART POWELL, welding foreman for L. E. Webb Construction Co., Inc., long-time Ranite user, combined Ranite with intermittent pass to reduce hardsurfacing time.

Although the Webb Construction Co. has been a Ranite user for more than two years, this is the first time Ranite was used for tractor maintenance and applied with an intermittent pass. Both Ranite "A" 3/16 and "B" 3/16 are being used for this purpose. Ranite was selected for its fast deposition rate, its resulting smooth weld bead and because it will not work harden.

Prior to shifting to Ranite, rollers were either sent out for rebuilding by automatic or were replaced with new ones. Actual savings now produced by using Ranite over automatic is $6 per roller with savings on sprockets and idlers totalling more than half previous costs. In addition, Webb Construction Co. has reduced actual hardsurfacing time by 50 per cent with the Ranite and intermittent pass combination.

Original parts used by them have a normal life expectancy of between 2000 and 3000 hours. Indications of Ranite hardsurfaced parts checked at 1000 hours of use are that the service span will be increased as much as three times.

Ranite, manufactured by Rankin Manufacturing Co., is the original metallic coated hardsurfacing rod in use throughout industry since 1938. It is made in several grades with a rod available to fit any hardsurfacing job. Toughness in proper relation to hardness is the answer to any wear problem and Ranite is alloyed on this principle with each grade being proportioned to give maximum wear for the job it is designed to do.

Cut your hardsurfacing time and costs now by shifting to Ranite. There's a Ranite rod for your particular application. For further information see your Ranite distributor or write to

Ranite
HARDSURFACING
WELDING MATERIALS

RANKIN
MANUFACTURING CO.
DEPT. E-12
616 SO. MARENGO AVE.
ALHAMBRA 2, CALIF.

NEWS . . . . . *from page 6*

session will be held Tues., Jan. 29, 9:30-11:30 a.m., with Vincent J. Richilano, assistant superintendent, methods, equipment and maintenance, Cadillac Motor Car Division of the Cleveland Ordnance, as the principal speaker.

The conference will be held concurrently with the 8th National Plant Maintenance & Engineering Show, also in Cleveland's huge auditorium. More than 20,000 persons are expected to view the exhibits of over 400 manufacturers of machines, supplies, equipment and services. Some 2,500 engineers are expected to attend the conference.

Form new air cylinder firm

The Hydair Cylinder Corp. has been formed in Cudahy, Wis., for the manufacture of air and hydraulic cylinders. Headquarters of the new firm are 5755 S. Pennsylvania Ave., in Cudahy—a suburb of Milwaukee. Jack L. Modrich is president.

In addition to air and hydraulic cylinders, the Hydair Cylinder Corp. will produce low pressure hydraulic cylinders, high pressure cylinders, counter-balance cylinders, boosters, accumulators and special cylinders.

Thompson Products to build test facility

Construction of a new $10,000,000 test facility has begun for the accessories division of Thompson Products, Inc., Cleveland. The new engineering and development center, for testing of fuel systems and auxiliary power systems for rockets and missiles, will be located on a 1,000-acre site near Roanoke, Va. The center is scheduled for gradual completion over a five-year period.

NWSA recommends new punching

National Welding Supply Association, Catalog Committee, has issued a new recommendation for punching. The new punching system is the same as the universal Kalamazoo type previously advised for all sheets for distributor use except that the two square notches for Kalamazoo binders are eliminated. Under the new recommendation, there will be only three round punches on the left side of each sheet. The change was made in view of decreasing call for binders to take sheets with universal Kalamazoo punching. The new punching is one that all printers can perform with a round punch or drill.

You can save money . . .

with the K-G SINGLE STAGE REGULATOR

It costs less, right from the start, and as long as you use it.

It stays "on stream", delivers the pressures and volumes you want . . . requires virtually no internal maintenance.

Pressure check protected Nylon seat, Stainless Steel filter and working parts, hi-strength forged Aluminum body, damage-proof adjusting mechanism . . . put the K-G Series 1200 Regulator years ahead in *service*, *economy* and *performance*.

Try it and you'll be convinced . . . order from your K-G distributor, or write to K-G.

the K-G equipment company, inc.

a unit of Air Products, Inc.
PO Box 538 Allentown, Penna.

GB Silver Brazing Alloys

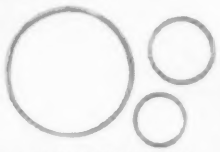
Used in Many Hospitals Where Safety Means Life or Death

Sound, leak-proof joints are a MUST in hospital construction requiring the piping of Oxygen and Anesthetic Gases to wards, rooms and nurseries *for instant use!* That's why leading designers and contractors specify dependable GB Silver Brazing Alloys, Preformed Rings and Fluxes.

GB Preformed Rings, for example, assure stronger, safer everlasting joints. They save time, require less metal, meet all specifications, cost less. Perhaps life or death are not a factor when you do silver brazing, but the dependability, efficiency and economy provided in GB products are good reasons for their choice . . . especially when they cost so little.

. . . Shown above is typical installation of oxygen wall outlet, snap coupler and flow meter. GB Preformed Rings are used to braze (1) wall assembly to screen; (2) tube to regulator; and (3) tube to gauge. For complete data write today.

GB FLUXES are fully active, deep penetrating, stable and economical. Produced under strict laboratory control they are extremely effective in producing high quality joints.



GB PREFORMED SILVER BRAZING RINGS are available in a wide range of sizes for all requirements. They are easy to use, save time and labor, assure lasting results.

GB SILVER BRAZING ALLOYS are made in random coils, strips and many special shapes in addition to preformed rings. Also available is Goldsmith's Technical Service Division cooperation for competent assistance in all brazing problems.

Dealer Distributor Inquiries Invited **Write for GB Data Book**

GB Goldsmith Bros. SMELTING & REFINING CO. Est. 1867

1300 W. 59th Street • Chicago 36, Ill. — NEW YORK • DETROIT • OAKLAND

Mail Coupon for your FREE copy of the GB Data Book — complete information on low temperature Silver Brazing

PLEASE SEND GB Data Book without obligation.

Name_____

Address_____

City_____ State_____

Foote purchases grinding facilities

Foote Mineral Co., Philadelphia, has purchased the ceramic grinding facilities of J. F. Morton, Inc., at Cold River, N. H. Foote has also leased feldspar mining properties in the Cold River locality. George B. Kneass, Jr., has been named plant manager.

Lincoln Foundation gives awards

The James F. Lincoln Arc Welding Foundation, Cleveland, recently presented awards in its engineering undergraduate mechanical and structural design competition.

First award of $1,250 went to Wayne Quinton of Seattle, Wash., for his design of a small arc welded air compressor for home use. The Foundation also granted $1,000 in scholarship funds to the mechanical engineering department of the University of Washington.

The awards represented top honors in this annual national competition. A total of 46 awards were made to students in 29 engineering schools. They were made to engineering undergraduates for their mechanical or structural designs in which arc welding was used. Designs ranged from small machine parts to large bridges.

The second award went to John Tierney and Karl Bartzsch of Cooper Union in New York for a welded Wichert plate girder which was then compared for savings with an existing riveted girder on a Raritan River bridge.

Richard Moran, Canton, Ohio, compared a conventional riveted building frame with a welded rigid frame designed according to the relatively new theory of plastic analysis. He received third award of $500.

NCG opens oxygen plant

The new plant of National Cylinder Gas Co., Chicago, in Portsmouth, Va., has begun production of oxygen and nitrogen. Sales and distribution offices are also located in the plant. Wilmer V. Coulter is branch manager for this area.

B&W to construct German reactor

The Babcock & Wilcox Co., New York City, will design and engineer a nuclear research reactor for Kernenergie Hamburg, the Society for the Utilization of Nuclear Energy in Shipbuilding and Navigation, Inc., of Hamburg, Germany. The plans also call for the manufacture and construction of the reactor.

MUREX

SPEEDEX-R

ELECTRODE

(iron powder similar to E-6010 type)

. . . in ANY weld position
a fast, high-quality deposit

SPEEDEX-R is an iron powder version of the popular Murex Type R electrode. An outstandingly easy rod to handle in every position, it has a stable, spray-type arc with little spatter loss. Deposit is fast to lay and easy to control, because it wets and spreads readily, freezes quickly. Slag is thin, glassy and easily removed even in confined areas. Welds have shallow-rippled, smooth surfaces when made with normal arc length and the usual welding techniques.

SPEEDEX-R electrodes offer the speed of iron powder electrodes in all positions for welds requiring high tensile strength, excellent ductility and freedom from porosity. They help to shorten production schedules and cut welding costs, and provide weldments with physical properties well above minimum requirements.

SPEEDEX-R *Applications:*

- **Pipe lines, pressure pipe**
- **Pressure vessels (fired and unfired)**
- **Tanks**
- **Low-alloy, high tensile steels, ¼" or less**
- **Steel casting repairs**
- **Plain or galvanized surfaces**
- **Field construction**
- **Machinery parts**
- **Shipyard applications**

Give SPEEDEX-R electrodes a try and see the results for yourself. For further information on how they may be applied to your specific problem, please write.

WELDING SUPPLIES
RADIOGRAPHIC EQUIPMENT
PLATING MATERIALS
ORGANIC COATINGS
CERAMIC MATERIALS
TIN & TIN CHEMICALS
METALS & ALLOYS
HEAVY MELTING SCRAP

METAL & THERMIT
CORPORATION

GENERAL OFFICES: RAHWAY, NEW JERSEY

Make Oxygen from Air

SUPAIRCO plants produce gaseous or liquid oxygen, gaseous or liquid nitrogen, acetylene, liquid air

Do you have our latest catalog?

New catalog describes single and double rectification plants and lists production data, shows flow charts and plant layouts. Single rectification type plants range in size from 300 to 600 cu. ft. per hour capacity, and double rectification type from 900 to 12,000 cu. ft per hour. Large liquid oxygen plants are available in capacities to 12 tons a day.

Free catalog on request

SUPERIOR AIR PRODUCTS CO.

130 Malvern Street, Newark 5, New Jersey

Manufacturers of production and storage equipment for gaseous or liquid oxygen, nitrogen, air, hydrogen and helium.

WATCHING Harold A. Roth, Air Reduction Sales Co., weld cornerstone are (l. to r.) P. B. Ruffin; B. Brewster Jennings; J. W. Galbreath; H. C. Turner, Jr.; J. H. Humberstone, Airco president; Benjamin F. Fairless.

Welding a cornerstone for N. Y. skyscraper

New York City's first and reputedly the world's largest stainless steel skyscraper — the 45-story Socony Mobil Building—was formally dedicated recently with the laying of a welded steel cornerstone. The steel cornerstone was set in place at the 42nd St. and Lexington Ave. corner of the new structure by Benjamin F. Fairless, president of American Iron & Steel Institute, and B. Brewster Jennings, chairman of the board of Socony Mobil Oil Co., Inc., major tenant for whom the building was named.

The "cornersteel" was sealed using special welding equipment supplied by Air Reduction Co., Inc., another tenant. Charles S. Munson, chairman of the board of Air Reduction Co., directed the welding operation.

A time capsule, scheduled for opening in 2056, was placed in the cornerstone. It contained messages from President Eisenhower, governor of New York and mayor of New York City, with copies of newspapers and predictions by corporations tenanting the building on status of their industries in 2056.

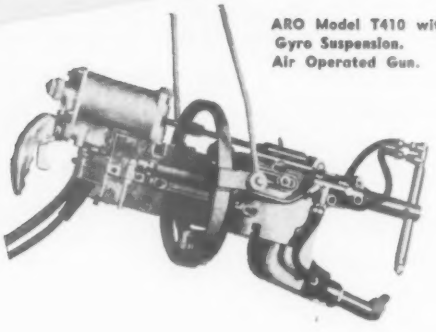
The two-part cornerstone consisted of a dedicatory outer plaque concealing the time capsule. Both plaque and capsule were made of stainless steel. Following the ceremonies the building was officially opened by cutting a ribbon of stainless steel rolled to 1/1000 in. thickness. *(See also "'Sky-high' welding on stainless-clad N. Y. office building," WELDING ENGINEER, Jan., 1956, p. 38.)*

NOW

25,000 OVER ~~23,000~~ IN USE

EASIER HANDLING

SAVES TIME — **ARO** — **SAVES MONEY**



ARO Model T410 with Gyro Suspension. Air Operated Gun.

Portable SPOT WELDERS

- No other machine of its size produces such high welding current
- Easy one-hand operation reduces fatigue . . . enables operator to maintain high production pace
- Easily adjustable spring pressure
- Trip-switch or timer according to model
- Air or water-cooled models

Air-Hydraulic and Air operated guns for high production also available.

ARO SPOT WELDERS

Illustrated Literature on Request

DIVISION OF

GUTHERY MACHINE TOOL CORPORATION

38-31 CRESCENT STREET LONG ISLAND CITY 1, NEW YORK

Dealer Inquiries Invited

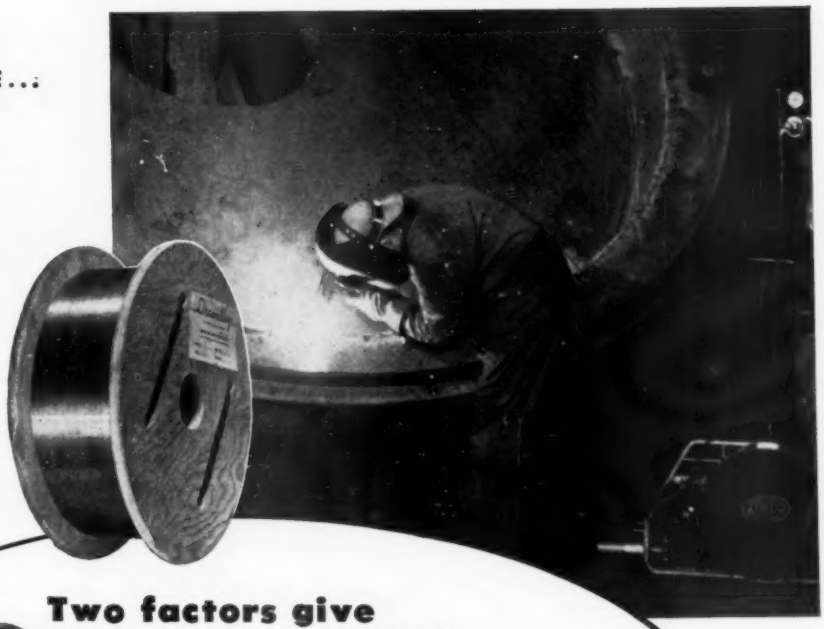
STAINLESS STEEL WELDING WIRE...

Spooled... layer wound to assure a smooth, even feed. Sizes: .035", .045", 1/16", 5/64" and 3/32" diameters.

Coiled... layer wound on rims for submerged arc welding. Sizes: 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.

Cut Lengths... straightened and cut wire furnished in 36" lengths for inert arc and gas welding.

Sizes: .035", .045", 1/16", 5/64", 3/32", 1/8", 5/32", 3/16" and 1/4" diameters.



Two factors give

Drawalloy

CORPORATION

WELDING WIRE

best on-the-job performance

WEAR-O-MATIC HARD-FACING WIRE...

Coiled... precision drawn for perfect roundness to insure continuous, smooth feed with any automatic head. Available in six Types for hard-facing applications.

Drawalloy welding wire is a product of two factors—years of experience in the welding industry combined with the best wire mill drawing practices. The result is clean welding wire with the proper finish, temper, diameter tolerance and chemical analysis. It's a wire that produces the highest quality welds continuously—with an easy, sure feed and a constant, smooth arc.

See your distributor or write Drawalloy Corporation, Lincoln Highway at Alloy Street, York 12, Pennsylvania

Drawalloy

CORPORATION

The Wire Mill For The Welding Industry

YORK, PENNSYLVANIA

Serving The Nation's Industry!

Like scales that are perfectly balanced, Coyne Cylinder Co. has timed its production and perfected its products to the exact needs of the nation's industry.

COYNE ACETYLENE CYLINDERS

Automatically Welded • New Coyne Monolithic Fillers with Increased Porosity for Greater Capacity and Faster Filling • Precision Produced and Tested to Insure Peak Performance.

Write Dept. A-4 for Specification Sheet and Price List.

ACETYLENE CYLINDERS

COYNE CYLINDER COMPANY
TWO PLANTS TO SERVE YOU

200 PAUL AVENUE
SAN FRANCISCO 24, CALIF.

155 W. BODLEY AVE.
MEMPHIS 9, TENN.

Alloys and Fluxes for joining and sealing

SWITCH TO ALL-STATE NO. 11

Eliminated 5 Separate Soldering Operations

Nickel Silver replaced Silver Solder
Gave better job — Lowered costs

The manufacturer of a famous one-man chain saw, developed standardized jigs, fluxing procedures and operational techniques enabling the substitution of All-State No. 11 Nickel Silver for more expensive silver solder in fabricating a critically stressed handle-bar unit. Record lows in cracking and breakage of brazed joints accompanied the consequent reduction of fabrication costs.**

ALL-STATE No. 11 is Versatile

- Brazes any combination of 14 metals.
- Saves on before and after brazing costs.
- Saves time. Yields 70-80,000 psi Tensile, 120-160,000 psi Shear.

10 lb. No. 11 should be enough to convince you. Comes bare or flux coated.

FREE Ask for Steel Folder

**Details on request

Ask your ALL-STATE Distributor for a Copy!

ALL-STATE INSTRUCTION MANUAL

A step by step guide for operators who weld, braze, solder, tin, cut without oxygen.

FREE! Your copy is waiting for you. This is The Manual to read from cover to cover for background . . . the one to keep in your pocket to have on the job. It gives you, at your finger tip, complete use data.

ALL-STATE WELDING ALLOYS CO., INC., WHITE PLAINS, N. Y.

Lincoln announces design competition

A total of 46 awards will be made in the 10th of its series of design competitions for college engineering undergraduates sponsored by The James F. Lincoln Arc Welding Foundation, Cleveland.

The foundation is offering $5,000 in cash awards to students and scholarship funds to schools for undergraduate mechanical or structural designs in which arc welding is used. Two separate competitions are open —one in mechanical and one in structural design. Winners and their schools also receive national professional recognition.

Any resident college engineering undergraduate is eligible. He may submit a design for any of the following: a machine, machine part, structure or structural part which makes significant use of arc welding. The entrant must be registered as a full time day student. Rules booklets are available from The James F. Lincoln Arc Welding Foundation, Cleveland 17.

X-raying welds in pipe mill

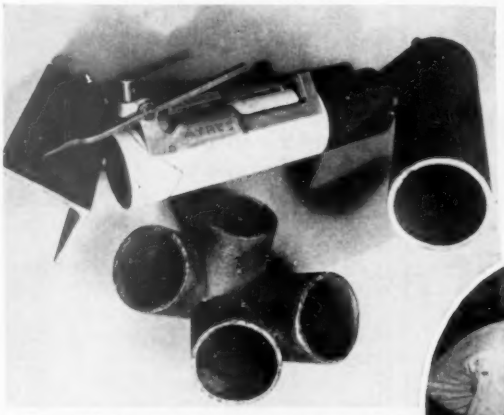
Consolidated Western Steel Co., Geneva, Utah, recently acquired a General Electric portable X-ray unit for continuous duty in inspection of assembly line pipe mill welds. Consolidated Steel manufactures pipe from 4-40 in. diameter and up to 5/8 in. thick.

The 175 kvp X-ray unit will be permanently mounted inside a lead housing. Pipe will be fed into the housing. Inspected pipe reaches the loading platform in 12 min. Film can be made, developed and read in time to prevent shipment of defective sections.

CONTAINING 3,100 sq ft of floor space, new office and warehouse of Interstate Welding Sales Corp. is located at 1801 Marinette Ave., Marinette, Wis. The structure was built in the firm's tenth year of business operation. Interstate, managed by Eugene E. Hart, president, is a distributor of welding equipment and supplies.

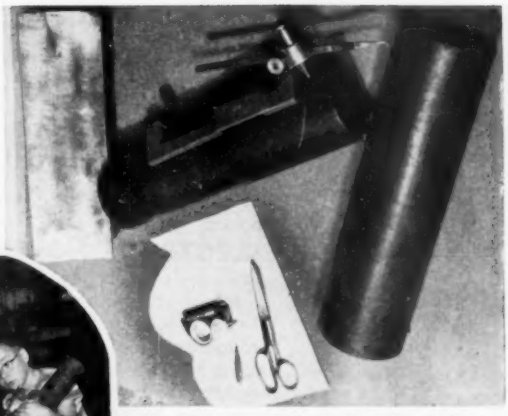
AYRES *Pipe Marker*

(Pat. Pend.)

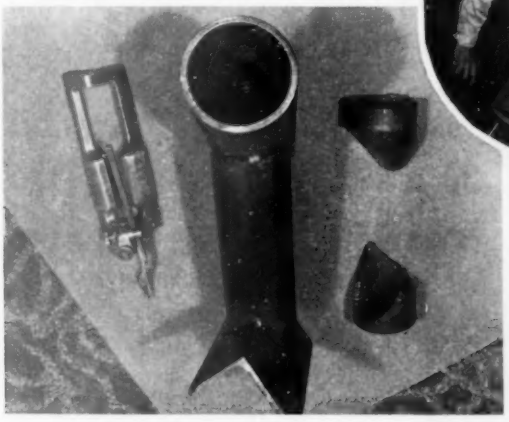


These all look complicated but were easily marked.

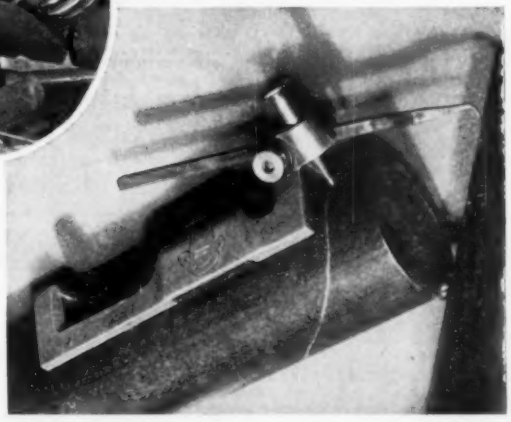
Templates are seldom needed but can be made very easily.



See how the pointer is allowing for thicknss of pipe.



The inventor watches a little neighbor boy mark a pipe successfully.



makes all marks easy marks

Ayres Pipe Marker is a neat little gadget, designed by an experienced weldor, to draw a clean perfect line on any pipe, large or small, thick or thin, at any angle. It is small, lightweight, and not complicated.

Here's what it can do:

It makes a mark as accurate as if done by mathematics, yet so easily that a child can do it. It will lay out pipe at any cockeyed angle against any surface, and do it quickly and accurately. The weldor *does not have to bevel the pipe* when he uses this clever instrument. It even compensates automatically for the *thickness of the pipe wall.*

No need to buy welding fittings. Two welds can be saved on a T-joint. Ayres pipe marker *does away with nearly all templates.* However, if one is needed, as in a very short connection, it speedily makes one.

No other marker has taken the form of a simple little hand tool that can be used in the field to join any tubing to any flat, curved or irregular surface—at any angle.

With the Ayres Pipe Marker, designers can use tubing more extensively. This important field has been *neglected and avoided because of the difficulties* met in making the layout for the connections of the tubing.

Now—there are no hard marks. All marks are easy.

The biggest mistake you can make with the Ayres Pipe Marker, is not to use it.

MADE IN THREE SIZES — for:

¾"—3"	2"—8"	8"—24" PIPE
$20	$25	$30

AYRES PIPE MARKER

(Pat. Pend.)

P. O. Box 572, Wilmington, Calif.

See what I did in a few minutes... using an Ayres Pipe Marker! No special training needed... anyone can do it — it shore is a good tool

For Years

HI-AMP®

has been FIRST with every important advancement made in

ELECTRODE HOLDERS

—no wonder then, that thousands of actual users have switched to HI-AMP—they quickly discovered, through experience, that you can't beat a HI-AMP Electrode Holder, regardless of model, when it comes right down to practicability, performance and economy in maintenance.

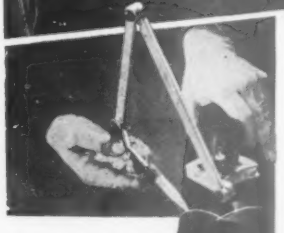
When are you going to switch? Just ask any Welding Supply Dealer ANYWHERE for PROOF of the above statement.

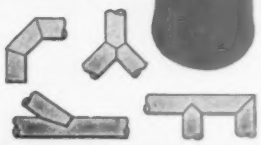
LENCO, INC.

(Formerly Wagner Mfg. Co. Inc.)

JACKSON, MISSOURI

Weld with HI-AMP





SAVE TIME AND MONEY!

A SMOOTH SWING of the Contour Marker's soapstone point and you're ready to cut! It's easy and *absolutely accurate* because there is an angle dial calibrated in both degrees and pitch. Any of the pipe joint angles shown can be marked off in minutes. And you save "man hours" as well as oxygen and acetylene gas because "cut and try" methods are completely eliminated. Two sizes are available complete with adapter for marking structural steel. Standard, for pipes from 1½" to 18" dia.; Jumbo, for pipes from 16" to 48" dia. Instruction book included. Belt case available. Write for information

CONTOUR MARKER CORPORATION OF CALIFORNIA

1843 E. Compton Blvd., Compton, California • NEwmark 1-9474

THE CONTOUR MARKER

McCracken opens first branch store

R. S. McCracken & Sons, Inc., Philadelphia welding supplier, recently opened its first branch store at 1020 Spruce St., Trenton, N. J. According to R. S. McCracken, president, the new branch will provide welding and cutting gases, welding apparatus, supplies and brazing alloys.

Rem-Cru to build new laboratory

Rem-Cru Titanium, Inc., Midland, Pa., has purchased 262 acres in Industry Township, Beaver County, Pa. The newly acquired property is located near the Ohio River about five miles northeast of the company's present production facilities in Midland.

The land is intended for future construction of a new research laboratory and administration offices. Rem-Cru Titanium is jointly owned by Remington Arms Co., Inc., and Crucible Steel Co. of America.

AWS-Los Angeles plans metal congress sessions

Charles W. Concannon, sales manager, Absco, Inc., has been named chairman of a committee to formulate technical programs for sessions by the Los Angeles Section, American Welding Society, at the Tenth Western Metal Congress. The congress will be held March 25-29 at the Los Angeles Ambassador Hotel.

Others named to the committee are David P. O'Connor, senior machinist foreman, Department of Water & Power, John R. Ross, west coast sales manager, silver brazing division, American Platinum Works and C. B. Smith, supervisor of materials and processing engineering, Douglas Aircraft.

M&T completes Canadian center

The new combined office, warehouse and manufacturing facility of Metal & Thermit-United Chromium of Canada, Ltd., began operation late in December.

Located on a four-acre tract on Factory St. in the Highbury area in northwestern Toronto, the 1½-story structure is 80 by 140 ft. Of cinder block construction, it is faced on two sides by brick. Office space will comprise 1,600 sq ft, the balance devoted to production equipment, warehouse space and boiler room.

Products will include welding compounds, organic protective coatings, chromium, copper and nickel plating materials.

Distributor holds open house

An open house and Welderama was held recently to celebrate the move into its new quarters by North-West Oxy-Acetylene Distributing Co., Wichita, Kans. The new building of North-West (illustrated) is 50 by 90 ft. Exterior walls are faced with 4 in. brick, with inner 8 in. of lightweight masonry block.

The floor of the entire structure is concrete at dock level. Roof is supported with pre-stressed concrete channel slabs, with clear span of 48 ft. The dock is sheltered with cantilevered extensions of the concrete channel slabs.

Windows of this modern structure are solid section steel projected windows. Display window in front is aluminum construction. Office area is painted block walls, asphalt tile floor and painted ceiling (exposed roof construction). Office has year-round air-conditioning with fluorescent lighting.

The warehouse is exposed concrete floor and unpainted walls and roof slabs. North-West Oxy-Acetylene Distributing Co. is located at 3001 N. Broadway and is under the direction of F. C. Hawks and M. A. Green.

Norton, Canada exchange atomic energy data

Norton Co., Worcester, Mass., has been authorized by the Atomic Energy Commission, Washington, D. C., to exchange information and services with the government of Canada on civil uses of atomic energy. This brings the total to five American companies who are now authorized to exchange such information with Canada.

Form AWS section in Baton Rouge

A new section of the American Welding Society has been activated in Baton Rouge, La. This addition to AWS will be known as the Baton Rouge Section.

Officers of the section are: Claude H. Elbourne, chairman; Maurice J. Simpson, vice-chairman; Everett G. Smith, treasurer; James M. Shilstone, secretary.

a NEW product . . .
means NEW time saving . . .
important NEW production gains!

York's

SPAT-R-PRUF COMPOUND 106

Don't sputter about spatter . . .
JUST WIPE IT OFF!

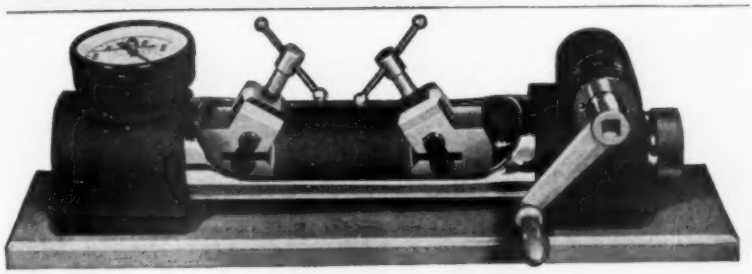
Completely eliminates grinding after welding. Just one coat, and spatter can be wiped away with a dry cloth.

Available 1 or 5 gal. cans, 5 gal. drums

- NO STIRRING OR DILUTION
- NON-TOXIC
- NON-INFLAMMABLE
- NO ODOR
- HARMLESS TO SKIN
- PERFECT PAINT BASE
- HELPS PREVENT RUST
- NO WELD POROSITY

YORK ENGINEERING CO.
2711 S. Kedzie Ave. Chicago 23, Ill

3 in 1 York's '77'
SPECIAL FLUX
FOR GENERAL BRAZING
FOR CAST IRON WELDING
FOR CAST IRON BRAZING



For shop or field—a new

Portable Tensile Tester

Use this compact, precision tensile tester to test strip steel, wire, bolts, spot welds, or anything else within its 4,000 lb. capacity. Besides its use for inspection work in the shop, this portable device provides a convincing method of demonstrating the tensile strength of various materials in sales demonstrations and trade shows.

Only a moderate pull on the crank is sufficient to apply the maximum load. Results are easily read from the load gauge. Simple to use, anywhere, any time. Write for catalog sheet and price.

DETROIT TESTING MACHINE COMPANY
9380 Grinnell Avenue, Detroit 13, Michigan

COMPLETELY
NEW
IMPROVED PERFORMANCE
Arcair® TORCH

- **Heat and impact resistant moulded plastic insulators lengthen insulator life up to FOUR TIMES.**
- **NEW PUSH-BUTTON air valve, completely insulated and doesn't need to be held down.**
- **Glass laminate sleeve protects handle from burning.**
- **Moulded upper arm handle fits hand, makes torch fully insulated.**
- **Cable connection inside handle, moves cable flexure away from connection, increases cable life.**
- **Insulating rubber boot on connection to welding lead. Insulates connection and can be instantly opened for changing connection.**

• OUR NEW MODEL H-3 Arcair torch includes many engineering improvements as listed at left, plus a new ease of operation! It's shorter, more compact size makes it much easier to use in hard-to-get-at places, and it gives better quality work faster on all jobs. All of the basic operation features such as rotating head and concentric cable which have made the model G-3 so popular, have been retained.

As with all Models of the Arcair torch, the new model H-3 uses only an electric arc and ordinary compressed air, and works on all metals. It's even more simple to operate, and has the usual wide applications throughout all industries. Write for complete information TODAY, and ask for the new Arcair Bulletin No. 6-1.

***Arcair* Company, 427 S. Mt. Pleasant St., Lancaster, Ohio**

AT THE FRONTIERS OF PROGRESS YOU'LL FIND

FOR WELDING AND CUTTING...

IN THE RED DRUM

HIGHEST QUALITY

DUST-FREE

AN AIR REDUCTION PRODUCT

NATIONAL CARBIDE

Write for the name and address of the NATIONAL CARBIDE supplier nearest you.

National Carbide Company

GENERAL OFFICES: 150 EAST 42ND STREET, NEW YORK 17, N. Y.

A DIVISION OF AIR REDUCTION COMPANY, INCORPORATED

Spokane supplier completes building

New, modern building of Spokane Welder Supply Co., Spokane, will provide 4,250 sq ft of office, display and warehouse space. Plans are underway for an addition of another 2,000 sq ft.

The new structure has ample parking space and a loading area of 6,000 sq ft for efficiency in the business operation. The sales area is well arranged with a large store front window for product display.

Established in 1946, Spokane Welder Supply, located at 1418 Trent Ave., is under the owner-managership of W. K. McCrea, who founded the firm. Spokane Welder Supply is a distributor for industrial gases, welding equipment and supplies. In addition, the firm has recently expanded its services to include specialists in the field of light metal welding.

255 attend NWSA Southeastern meeting

Held Dec. 3-4 at the Dinkler-Tutwiler Hotel, Birmingham, the Southeastern Zone meeting of the National Welding Supply Association set a new high with 255 members and guests registered.

Vice-president Beaver of NWSA presided at the business sessions. The Dec. 3 session featured remarks by President Stillwell and talks by Warren Whitney, vice-president, James B. Clow & Sons, Inc., and P. K. Seidman, Seidman & Seidman, on business organization vs. taxes. W. M. Haile, vice-president, Linde Air Products Co., spoke on "The welding supply distributor—yesterday, today and tomorrow."

A panel discussion spotlighted William A. Rice, president, Virginia Welding Supply Co., and T. B. Jefferson, publisher and editor of WELDING ENGINEER. E. C. Caluwaert, chairman of the catalog committee, reported on the Tab Index System, stressing the value of uniform cataloging to distributors and manufacturers.

The Dec. 4 session began with a humorous discussion of culture in cussing by Professor Clyde Crobaugh, University of Tennessee. J. C. Hurley, Standard Oil Co. of Indiana, presented the final address on fringe benefits.

Spanish group views American welding

Touring the United States from Nov. 9 to Dec. 21 (last year) a group of ten members of the Spanish metalworking industry has returned home to compile a report of its findings. The visit of the group was under the auspices of International Cooperation Administration, Washington, D. C., with the aim of broadening knowledge of welding. The group included the director and chief technical engineer of the Spanish Welding Institute.

A half-day orientation meeting was held Nov. 13 at the Sheraton-McAlpin Hotel, New York City. The group was given an opportunity to meet welding industry executives and discuss welding problems before the tour. Among those present at this meeting was Herman C. Phelps, eastern district manager of WELDING ENGINEER.

Firms visited in the country-wide tour included Linde Air Products Co., Air Reduction Co., Inc., M. W. Kellogg Co., Inc., Eutectic Welding Alloys Corp., General Electric Co., Ford Motor Co., A. O. Smith Corp., Sciaky Bros., Inc., Lincoln Electric Co.

The report of the group will be publicized in Spain by the Spanish Productivity Center and the Spanish Welding Institute.

IAA elects C. Ness honorary member

The International Acetylene Association recently elected C. Ness an honorary member. Formerly superintendent of Speedway Laboratories of Linde Air Products Co., Mr. Ness was 1951 Morehead Medalist in recognition of his contributions to design in acetylene generation, distribution and packaging. The status of honorary member is voted by IAA in order to recognize those outstanding persons in the acetylene industry. Mr. Ness retired from Linde on August 1 of last year.

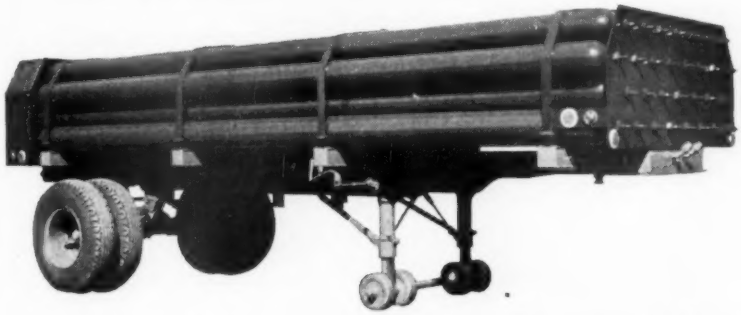
Welding course for home-study

A correspondence course covering fundamental principles and practices of welding has been made available by National Technical Training Services, Buffalo, N. Y. The course includes welding methods, procedure control, distortion control, weldability, welding metallurgy, design inspection, materials and equipment, estimating and cost. It is divided into 16 lessons and requires about 10 months to complete. Details are available from National Technical Training Services, 260 Delaware Ave., Buffalo, N. Y.

REDUCE CYLINDER HANDLING up to 50%

with INDEPENDENT *Gas Supply TRAILERS*

TRANSPORTING — Argon — Carbon Dioxide — Helium — Nitrogen — Oxygen — Boron Trifluroide — Hydrogen — Ethylene. Trailer capacities from 187,000 cu. in. to 750,000 cu. in. water capacity. Trailer tubes ICC3A-2400 Specifications with 2400 PSIG Working Pressure.



Sizes and weights to meet all State requirements.

Can be mounted on bases for permanent storage.

INDEPENDENT ENGINEERING CO., Inc.

CONSULTING · RESEARCH · DESIGNING

O'FALLON 5, ILLINOIS

DIAL SET LEVEL _____

MARK A CENTER LINE *at any angle*

DIAL SET 45°

MEASURE DECLIVITY

CHECK ANGLE BENDS

ESTABLISH BUTT-IN ANGLES

TO ESTABLISH AND MARK a point at any degree of angle on shaft, pipe or tube without numerous calculations or "cut and try" methods use the Boyce Centering Head. It's a must for welders, machinists, pipe fitters and boilermakers because it is *absolutely accurate* and saves time. Small enough to fit in your pocket, it weighs only 9 ounces. Order yours today or write for information.

CONTOUR MARKER CORP.
1843 E. Compton Boulevard, Compton, California

Boyce CENTERING HEAD

Tempilstiks°

THE CRAYONS THAT TELL TEMPERATURES

IT'S THIS SIMPLE

- Select appropriate TEMPILSTIK° for the working temperature you want.
- Mark your workpiece with it.
- The TEMPILSTIK° mark melts as soon as its temperature rating has been reached.

Accuracy within 1% of rated melting point.

Also available as TEMPILAQ° (liquid form) and TEMPIL° PELLETS

63 different temperature ratings available

For information and samples, send coupon

Tempil° CORPORATION
134 West 22nd St., New York 11, N.Y.
Send information on:

☐ TEMPILSTIK° ☐ TEMPILAQ° ☐ TEMPIL° PELLETS

☐ Send booklet "How Temperatures are Measured"

☐ Send sample pellets for _____°F temperature

Name_____
Address_____
City_____
State_____

COMING EVENTS

JAN. 21-23: Forty-fourth Annual Meeting, Compressed Gas Association, Waldorf-Astoria Hotel, New York City.

JAN. 28-31: Eighth National Plant Maintenance & Engineering Show, Cleveland Public Auditorium, Cleveland.

JAN. 30-31: Midwest Welding Conference, Armour Research Foundation of Illinois Institute of Technology, Chicago.

MARCH 11-15: Atomic Exposition & Nuclear Congress, Convention Hall, Philadelphia.

MARCH 25-29: Tenth Western Metal Congress & Exposition, American Society for Metals, Los Angeles. Congress at Ambassador Hotel; exposition in Pan-Pacific Auditorium.

APRIL 1-3: Fifty-seventh Annual Convention, International Acetylene Association, Hotel Nicollet, Minneapolis.

APRIL 8-12: Fifth Spring and Thirty-eighth Annual Meeting, American Welding Society, Hotel Sheraton, Philadelphia.

APRIL 9-11: Fifth Annual Welding Show, American Welding Society, Convention Hall, Philadelphia.

More new members for NWSA

The following firms have joined the National Welding Supply Association: Spain-Boyer Welding Equipment Co., Atlanta, Ga.; Geo. W. Fowler Co., West Palm Beach, Fla.; Hardie Engineering Co., Inc., Roanoke, Va.; Hendersonville Welding Co., Hendersonville, N. C.; Welders Supply, Inc., Nashville; Welding Service Co., Savannah, Ga.

1956 into 1957 . . .

Augurs well, according to all signs. Outlook for this year of 1957 is continued expansion, conditions favorable, as evidenced in the following:

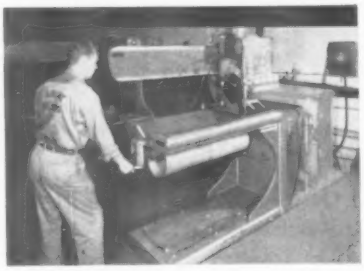
Continued growth of existing and new markets for aluminum is foreseen by Aluminum Co. of America. Vigorous sales promotion coupled with technical advances and plentiful supply of metal are expected. Alcoa's primary aluminum production reached high of 750,000 tons in 1956. This year annual capacity is expected to reach 962,000 tons.

Production and sales of valves for pneumatic industry will increase more than 25%, reaching volume of ¾ million, according to R. J. Cameron, president of Ross Operating Valve Co.

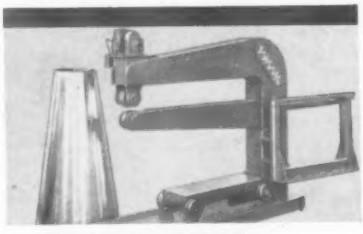
Sales of investment casting industry (patterns and forms for precision parts used in electronics, aircraft industries, etc.) reached estimated $160,000,000. Output for this year—$175,000,000.

how to make fusion butt welding a ***push-button operation***

CIRCUMFERENTIAL *automatic welding fixture*
Designed for circular welding of components with automatic chucking and ejection of parts and transfer. Chuck expands internally for sizing. Surface speed to 300″ per min.



LONGITUDINAL *automatic fusion butt welding fixture*
Hold-down fingers with "toe touch" control lock parts in position for welding. Back-up mandrell with up to 6 copper inserts permits fast job changes. Handles all weldable metals .005 to 1″ thick and lengths from 2′ to 12′.



ROLL PLANISHING FIXTURE
Cold-rolls and smoothes fusion welds (circ. & longit.) under controlled pressure up to 10 tons. Handles 1¼″ to 10′ dia. and lengths to 16′.

Write today for further information
785 No. Prairie Ave., Hawthorne 2, Calif.

Airline WELDING
WELDING & ENGINEERING
FIXTURES & POSITIONERS
"guides the arc to the mark"

J. Henri Siegel has been appointed superintendent of the welding laboratory, U. S. Naval Engineering Experiment Station, Annapolis, Md. He had been acting in that capacity since June of this year when *Bela M. Ronay*, former superintendent, retired. Mr. Siegel has been associated with EES for 23 years, starting as an electrician's helper in 1933. A year later he joined the welding laboratory. He recently received a patent for an "Apparatus for testing tube welds under pressure at high temperature." He is a member of the American Welding Society; represents the Station on the American Society for Testing Materials Committee E-7 for Nondestructive Testing. He is also a member of American Institute of Electrical Engineers' committee for research on the welding arc.

F. J. Purdy has been appointed sales manager of Westinghouse Electric Corp.'s arc welding department, Buffalo, N. Y. He suceeds *A. J. Hendry*, who has been named sales manager for the standard control division, Beaver, Pa. Mr. Purdy has been section manager of welding machine sales. *D. L. Maus* succeeds him as section manager. *John H. Glass, Jr.*, has been named purchasing agent for the welding department.

Anthony Maladra has been appointed sales manager by K S M Products, Inc., Stud Welding Division, Merchantville, N. J. He has been associated with K S M for more than six years. He has been most recently assistant sales manager since 1952. He is a member of the American Welding Society.

Thomas A. Hickey has been named regional sales manager for the southeast zone by K-G Equipment Co., Allentown, Pa. Mr. Hickey had been associated with the Gasweld Division, Liquid Carbonic Corp., Chicago.

J. R. (Joe) Thompson has joined the sales staff of The Fibre-Metal Products Co., Chester, Pa. His territory will cover the north-central west from North Dakota to Indiana, including Iowa, Nebraska; he will work with welding and safety supply houses.

For PROTECTION you NEED with the COMFORT you WANT
Flood Always
FINEST QUALITY
FAIRLY PRICED
FIBER GLASS HELMET
Strong, one-piece molded shell. Lightweight. Non-warping. Heat and moisture resistant. Easy to clean and sterilize. Comes with Flood No. 14 fiber or No. P-14 all plastic ratchet-type head gear.
FACE SHIELD
Excellent protection for spot welding, grinding, buffing, acid pouring. Fiber forehead shield. Contour headgear. Easy, window replacement without tools.
Mfrs. of welding and Ind. Safety Equipt. including Flood's 1000-Hour Cover Lenses.
FLOOD SAFETY PRODUCTS CO.
3035 West Lake Street, Chicago 12, Illinois

WELDERS' CLAMPS
Individually Power-Tested for Better Performance
THE MOST COMPLETE LINE
HARGRAVE
The most complete line of clamps. Stock sizes from ¾ in. to 12 ft., openings from ½ in. to 16 in. deep.
WRITE FOR FREE CATALOG
Showing a clamp for every purpose, also Chisels, Punches, Masonry Drills for hand and power hammers, Gasket Cutters, Brace Wrenches, File Cleaners, etc.
There is an Industrial Distributor Stock Near You.
THE CINCINNATI TOOL CO.
1944 Waverly Ave., Cincinnati 12, Ohio

TILLMAN

Gloves—Garments

WELDORS BUY FROM YOUR DEALER

ASK FOR OUR NEW CATALOG

BRAZILIAN DEERSKIN
THE "STAY SOFT" LEATHER
GLOVES AND MITTENS

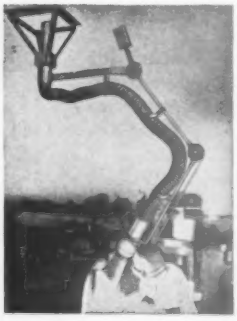
TILLMAN PRODUCTS
John Tillman & Co.
Long Beach, Calif.

Weld-O-Vent

"World's Finest Exhaust Systems"

Welding Fume Exhausters

MANY EXCLUSIVE FEATURES



High Velocity Hood Quickly Removes Smoke and Fumes.

- Portable and stationary units for all applications.
- Unlimited flexibility, fast, easy positioning, over 360° radius.
- Blowers can be attached to units or mounted at remote points connecting with ductwork.
- Units can be connected in series.

Available in 9, 12, or 16 feet reach units.

Write For New Application DATA to Dept. W. E.

Engwald Corporation
357 LAFAYETTE AVE.
BROOKLYN, N. Y.

Fred H. Lewis has joined the staff of Air Products Co. in Allentown, Pa. He was formerly associated with Liquid Carbonic. in Chicago.

A. O. Smith Corp., Milwaukee, has made the following appointments: *U. T. Kuechle* has been named vice-president, he had been automotive general sales manager since 1954; *Roy A. Dingman*, who joined the company in 1956 as director of industrial relations, has been named vice-president; *Robert A. Rietz* has been named assistant secretary.

The following appointments have been made by Norton Co., Worcester, Mass: *Duane E. Webster* has been named assistant to director of manufacturing; *Frank G. Gifford* has been named works manager of the abrasive division; *David Reid Jr.*, has been named factory manager.

Philip O. Geier, Jr., has been appointed to the newly created position of assistant manager and *Harold W. Cottrell* to sales manager of the Cincinnati Milling Products Division, Cincinnati Milling & Grinding Machines, Inc., Cincinnati. Mr. Geier, sales manager for the past two years, has been with Cincinnati Milling for more than 17 years. Mr. Cottrell has been associated with the firm since 1936.

Geier

T. C. Vogel, head of advertising and sales promotion of Square D Co.'s Industrial Controller Division since 1945, has been named publications specialist for all divisions. *George Pasdirtz*, formerly assistant head of the advertising section, has been named manager.

Everett A. Andes has been appointed advertising manager of The Girdler Co. and Tube Turns, Louisville, Ky. National Cylinder Gas Co., Chicago, is the parent organization. He has been associated with Girdler and Tube Turns since 1947.

E. A. Daniels, vice-president in charge of sales, Victor Equipment Co., San Francisco, has been appointed a member of the Welding Equipment Industry Advisory Committee by the United States Department of Commerce, Business & Defense Services Administration, Washington, D. C.

HEALTH PROTECTING . . .

"ANTI-BORAX"

CAST IRON

No. 1 WELDING FLUX

Acts as a cleansing agent—removes all impurities in the metal at the weld—prevents formation of oxide—eliminates blow holes—makes possible a better granular, softer, more ductile structure in the weld. Starts melting at 1150°—completes: 1275°.

ALSO

2—Brazing Flux for Brass, Bronze, etc.
3—Brass, Bronze Welding Flux
4—Flux for Bronze Welding Cast Iron
5—Extra Quality Aluminum Flux
7—Steel Flux
8—Sheet Aluminum Flux
9—Stainless Steel Flux
11—Tinning Compound
12—Burnt Cast Iron Welding Flux
13—Brazing Flux for Extruded Bronzes
14—Special Brazing Flux for Aluminum Bronze, Everdur, and all Silicon Bronzes
15—Special Flux for Magnesium Alloys, Dow Metal, etc.
16—Silver Solder Paste Flux

Profit by the Use of One or More of These Products

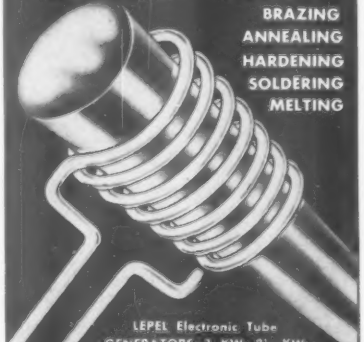
Choose the one best suited to your needs and order by number. All ANTI-BORAX Products guaranteed. Send for circular and free sample.

ANTI-BORAX COMPOUND CO., INC.
FORT WAYNE, INDIANA

Lepel

HIGH FREQUENCY
Induction
HEATING UNITS

BRAZING
ANNEALING
HARDENING
SOLDERING
MELTING



LEPEL Electronic Tube GENERATORS—1 KW; 2½ KW; 5 KW; 10 KW; 20 KW; 30 KW; 50 KW; 75 KW; 100 KW.
LEPEL Spark Gap Converters 2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

When You Weld Cast Iron
Select the Correct

Fuse-Well

CAST IRON WELDING RODS
OR ELECTRODES

FUSE-WELL NO. 11

FUSE-WELL No. 11, *Square*—Gray Cast Iron Welding Rod for Acetylene use in filling or building up new or worn castings producing machineable welds.

FUSE-WELL NO. 12

FUSE-WELL No. 12, *Round*—Has the same uses and analytical ingredients as Fuse-Well No. 11.

FUSE-WELL NO. 14 MOLY

FUSE-WELL No. 14, *Moly*—An Iron Base Rod with alloys added for finer grain structure and greater strength.

FUSE-WELL NO. 22

FUSE-WELL No. 22, *Electrode* — Light coated Rod to be used for AC or DC welding in the fabricating and repairing of cast iron castings.

Sold through Leading Distributers

THE CHICAGO HARDWARE FOUNDRY CO.
Weld Rod Division
NORTH CHICAGO, ILLINOIS

Choose Huntsman angle-shape for

- reduced glare from behind
- better top-of-head protection
- easy fit in your toolbox
- scientific upward ventilation
- longer helmet life

Specify the complete line of quality-built, guaranteed products

HUNTSMAN "face savers"
WELDING HELMETS, FACE SHIELDS & ACCESSORIES
Redman Co., 233 So. 5th West, Salt Lake City 1, Utah

N. H. Hobbie has been appointed district manager of the Charlotte, N. C., area by Air Reduction Sales Co., New York City. He has been assistant sales manager for the Charlotte area. He succeeds the late *J. B. Davenport*. *J. S. Stevens*, zone manager in Airco's railroad department, succeeds Mr. Hobbie as assistant sales manager.

Robert H. Macy recently resigned as technical assistant to the president of The Ingalls Shipbuilding Corp, Pascagoula, Miss. He will enter into business for himself as a consulting naval architect and marine engineer. Mr. Macy joined Ingalls in 1941, leaving for two years as technical advisor to the Minister of Public Works in Buenos Aires, Argentina, together with a brief term as chief naval architect with Palmer & Baker of Mobile. *George Slifer*, chief of design, will serve as acting technical assistant to the president.

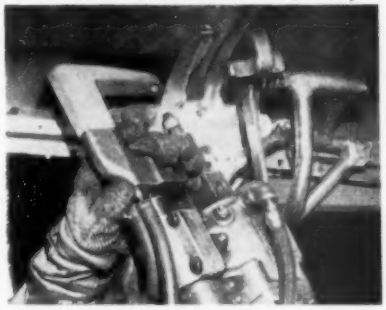
E. B. Lutes has been elected vice-president in charge of engineering and *L. G. Marini* has been elected vice-president in charge of production by Arcrods Corp., Sparrows Point, Md. Mr. Lutes joined the firm in 1939 and has served as chief inspector, research and development engineer and welding engineer. He is a member of the American Welding Society. Mr. Marini has been actively engaged in various management capacities in the welding industry since 1939. He joined Arcrods in 1946. He is also a member of the AWS.

M. L. Sundeen has been appointed district engineer for the Detroit office of KSM Products, Inc., Stud Welding Div., Merchantville, N. J. He will cover the three-state area of Michigan, Ohio and Indiana. *J. J. Redding* has been named to the Chicago district office of KSM. His territory will cover northern Illinois, Wisconsin, Minnesota and northern Michigan.

Recent changes in the field sales staff of the Nelson Stud Welding Division, Gregory Industries, Inc., Lorain, Ohio, were as follows:

Boyd Robinson, for the past two years field engineer in the Philadelphia area, has been transferred to Boston. *George F. James* has been transferred from the customer engineering department in Lorain to New York City. *Joseph Curry* has joined the Philadelphia sales staff. *Walter Lauer*, formerly an officer in the U. S. Navy, has joined the New York sales staff. *David A. Despard* has joined the Houston sales organization.

Faster Production, Less Spoilage



An amazing new insulation coating that painted on, dries overnight to protect electrodes, horns, holders, seam welding wheels and arms . . . "No-Short"

A firm, chip-proof, abrasion-resisting dielectric coating that prevents "shorts". Saves on expensive work-stoppage, damaged rejects, pitted electrodes and holders, blown fuses, and loose welds. Resistance welding equipment coated with "No-Short" speeds production.

"No-Short" is a product of

LOVELL CHEMICAL CO.
Watertown 72, Massachusetts

TIG WELDING
Made Easy With
"Visuweld" Torches

VISUWELD torches improve and simplify tig welding by giving faster and better welds with less effort and minimum torch maintenance.

- The lightest and smallest 350 amp TIG welding torch with super maneuverability.
- Only TIG torch made with standard size transparent cup that guarantees absolute welding visibility.
- NO SPARE PARTS NECESSARY. No gaskets or parts to 'screw together'.
- VISUWELD contained unit torch head guarantees no water or gas leakage, and the coolest TIG welding torch ever designed.

Perfect welds at welding ranges from 3 to 350 Amps eliminates the need for 'standby' torches. VISUWELD torches are 3 torches in 1.

TEC TORCH CO., Inc.
300 Paterson Ave. Carlstadt, N. J.

free literature. . . . . USE CARD ON PAGE 107

51. HARDFACING — American Manganese Steel Division. Bulletin 6-56 (2-color, 6 pages) describes "Amsco" semiautomatic welder for hardfacing. Included are cross-sectional and cutaway drawings, and a section on the new tubular electrodes.

52. RADIOGRAPHY—Nuclear Systems. Revised catalog "Gamma radiography" details in 17 pages, amply illustrated, construction, and uses of radiographic inspection units utilizing gamma sources.

53. HI-TEMP BRAZING—Handy & Harman. Bulletin 22 concerns series of high-temperature brazing alloys for stainless steel and variety of heat-resistant alloys. Included is 6-step procedure for getting high quality joints. Illustrated.

54. MOTORS—The Lincoln Electric Co. 4-page illustrated bulletin (SB-1345) discusses line of "Linc-Weld" motors recently introduced as welder power source.

55. WELDING PLATES—Lake Shore Engineering Co. Illustrated 8-page booklet details welding base plates along with surface and layout plates.

56. ARC WELDING STUDS—K S M Products, Inc. Illustrated 36-page booklet describes arc welding studs most commonly accepted as industry standards. Contains complete index, reference to equipment, accessories.

57. TUBE CUTTER—Nickelson Tool & Die Co. 4-page illustrated folder discusses the Woerner hydraulic-operated tube cutter for use in welding.

58. LIFTING DEVICES—Merrill Bros. Types of lifting devices—lifting clamps, with models and specifications are subject of illustrated 4-page folder.

59. BENDING—Pedrick Tool & Machine Co. Illustrated descriptive sheet concerns types of bending machines.

60. INDUSTRIAL RADIOGRAPHY — Holger Andreasen, Inc. Fully illustrated color brochure explains construction and use of "Andrex" 200 kv and 260 kv portable X-ray units for weld inspection.

61. DESCALING PROCESS—Wheelabrator Corp. Bulletin, "Steel mill cleaning news," deals with mechanical blast descaling process. It covers descaling of hot rolled steel sheet and strip, slabs and billets, and plate.

62. ALUMINUM CABLE—Tweco Products, Inc. Colorful 4-page bulletin TL-201 contains many practical hints on use of aluminum welding cable, telling do's and dont's of its use.

63. ABRASIVE GUIDE—Pangborn Corp. Bulletin No. 333 is a 12-page illustrated manual on blast cleaning abrasives—characteristics, application, selection. Tables are included of sizes and screening specifications.

64. RELAYS, SWITCHES — Jaidinger Mfg. Co., Inc. Catalog 1956-57 contains data on 40 different switches and relays, ranging in size from standard size to miniature, giving operation characteristics of each. Illustrated fully.

65. FLUXLESS BRAZING—Aeroprojects Inc. Bulletin SB-6A describes "Sonobond" ultrasonic units for fluxless brazing and coating of aluminum.

66. GALVANIZING—American Solder & Flux Co. Folder describes and illustrates "Drygalv" cold galvanizing compound that rustproofs iron, steel surfaces, prevents corrosion at welded joints.

67. WORKBENCHES, TABLES—Equipto. Reference manual No. 485 is 48-page book analyzing steel work benches, tables, shelving, lockers and other types of shop equipment useful to the welding industry.

68. ELECTRODE—Ampco Metal, Inc. Bulletin W-17 describes use of "Ampco-Trode" electrodes for repair of worn gears. Electrodes are series of five copper base alloys with hardnesses from 130-380 bhn.

69. INDUSTRIAL X-RAY—Mitchell Radiation Products Corp. Catalog sheet illustrates and describes "Isovolt 150" industrial X-ray unit for radiographic inspection.

70. OXYGEN CYLINDER — Cambridge Corp. Illustrated catalog sheet describes and gives specifications of "Loxette 3000" oxygen cylinder, model "3-225" capable of holding 3,000 cu ft of gaseous oxygen.

71. HEADREST GOGGLE—The Fibre-Metal Products Co. Bulletin No. 53 illustrates and describes new headrest "Sologoggle", for brazing, cutting, welding and grinding. Combination of goggle and headrest can be easily adjusted.

72. ACETYLENE TORCH—Velocity Power Tool Co. Bulletin No. 1413-7 discusses the "Torch-O-Matic" acetylene torch that lights automatically from battery-powered ignition.

73. HYDROGEN WELDER—General Electric Co. Publication GEC-598 describes atomic hydrogen welder recently redesigned.

74. SALAMANDERS — Insto-Gas Corp. Illustrated sheet (form No. 256) describes "Insto-hot" salamanders. Also included are infra-red portable gas heaters.

75. HELMETS, GOGGLES—Dockson Corp. Two illustrated sheets discuss welder's helmets and goggles.

76. AIR COMPRESSOR—General Detroit Corp. Sheet treats model "FE-190" portable air compressor for pressurizing, spraying. Can be used for pressurizing "Quick-Aid" fire extinguishers.

77. WELDING GUNS—Craft Welding Equipment Co. Folder describes models of resistance welding guns, including fixture type welding guns.

78. RESISTANCE WELDERS — Multi-Hydromatic Welding & Mfg. Co. 20-page booklet illustrates and describes resistance welders—spot, seam, automatic multiple spot welding machines, fixtures, transformers and accessories, welding presses.

79. HOLDING FIXTURES — Universal Vise & Tool Co. 16-page illustrated catalog gives full information on safety workholders, angle vises, clamps, adjustable angle plates.

80. WHEEL DRESSERS—K. O. Lee Co. Catalog sheet shows models of abrasive wheel dressers, with recommendations for use.

81. POWER WINCH—Multiple Corp. 4-page illustrated folder discusses the new "Multi-Pul" power winch designed to lift, lower and pull.

82. HELMET ATTACHMENT—The Fibre-Metal Products Co. Bulletin No. 49 describes, with illustrations, the "Quick-Lok" welding helmet attachment for joining welding helmet to safety cap.

83. CAP, CORD CONNECTOR—Rodale Mfg. Co., Inc. Descriptive sheet 58 discusses 30 and 50-amp caps and cord connectors, with solderless pressure plate type terminals, ideal for use in welder power lines.

84. SPHERICAL CORNERS—Conner Steel Products. Illustrative sheet describes spherical corners available in steel or aluminum for weldments.

85. POSITIONER — Grayson Tool Co. Catalog page discusses the "No. 1502" welding positioner with two arms for holding work rigidly during welding, soldering, metallizing.

86. ELECTRODE—Eutectic Welding Alloys Corp. Illustrated procedure sheet, "1,001 ways to save with new 'low amp' EutecTrode 680 AC-DC," discusses new electrode for high alloy steels.

87. HEAT TREATING—Surface Combustion Corp. Folder SC-176 discusses mechanized heat treating giving various types of systems.

88. IGNITRONS—General Electric Co. Sheet ETI-1373 is a selection chart for ignitrons, thyratons. Booklet ETI-1121 is 16-page discussion of ignitrons for welding control giving types, characteristics, amply illustrated with charts and photographs.

89. EYE PROTECTION—Jones & Co. 4-page booklet illustrates and describes visor goggles for eye protection.

90. GRINDERS — Porter-Cable Machine Co. 32-page illustrated 1957 catalog describes 69 portable electric tools and kits—grinders, drills, electric saws, abrasive belts, carbide-tipped bits.

91. CO_2 WELDING—A. O. Smith Corp. 4-page illustrated folder discusses "C-Omanual" carbon dioxide hand gun welding.

WHERE TO BUY

6714 Bryn Mawr Ave.

CLASSIFIED **EMPLOYMENT • BUSINESS •**

THE WELDING SHOPPER

OPPORTUNITIES

ADVERTISING • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE
(Not available for equipment advertising)
90c a line, minimum 3 lines. To figure advance payment, count 5 average words as a line.
INDIVIDUAL EMPLOYMENT WANTED advertising rate is ½ the above rates, payable in advance.
PROPOSALS, 90c a line an insertion.

INFORMATION
BOX NUMBERS count 1 line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE
The advertising rate is $8.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. W.E.

SCHOOL

WELDING—A profitable trade. Demand for trained men. Learn quickly at best equipped school in U. S. Non-profit. G. I. approved. Catalog free. Write: Hobart Welding School. Box U-171, Troy, Ohio.

BUSINESS OPPORTUNITIES

A NICE REPEAT BUSINESS
JOBBERS WANTED IN EVERY CITY TO SELL "WELDER'S PAL" EYE DROPS
On the market for 20 years
CARHOFF COMPANY
11706 Kinsman Rd., Cleveland 20, Ohio

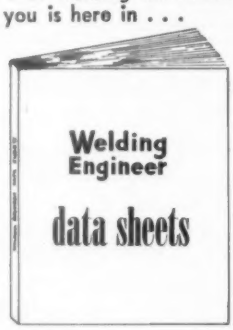
REPRESENTATION WANTED
Organizations or individuals now selling welding equipment and seeking a better connection. We build portable welding guns, standard welders, special welding machines and automation welding equipment. This is a young firm with lots of go looking for top notch men. We are now building for the large manufacturers and can support your efforts with creative designing and manufacturing ability.
Send replies to: Box No. 1210—c/o Welding Engineer, 12 E. Grand Ave., Chicago 11, Ill.

HELP WANTED

SALESMAN WANTED — Central and North Jersey area. Submit written resume. Jersey Welding Supply, Inc., 234 East Third Street, Plainfield, New Jersey.

Fingertip Control

. . . of welding information to help you is here in . . .



This cross-indexed volume contains 116 of the best Data Sheets appearing in WELDING ENGINEER in the past 15 years. Yet it costs only $1.40!

See your welding supply distributor or order from:

Welding Engineer
12 E. Grand Ave.
Chicago 11, Ill.

HELP WANTED

WELDING ENGINEER—Requires college graduate, preferably with a degree in welding engineering. To assist Chief Construction Engineer in the establishment and maintenance of welding quality control on field projects, including investigation or development of new techniques, methods and materials. Send resume to Mr. R. L. Stacom, M. W. Kellogg Co., 711 3rd Avenue, New York, N. Y.

ELECTRODE COATING RESEARCH CHEMIST

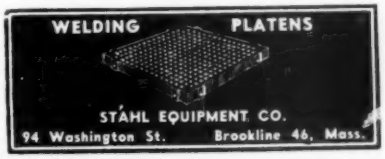
Manufacturer of specialized electrodes and welding rods is expanding its Research Department.

Interesting position is available requiring experience in metallurgy, chemical analysis and coating formulation.

Excellent facilities, stimulating and congenial atmosphere; good advancement possibilities.

Submit full resume, salary requirements to Eutectic Welding Alloys Corp., Attention Director of Manufacturing, 40-40 172nd Street, Flushing 58, New York.

EQUIPMENT FOR SALE



SMITH CUTTING TIPS
Guaranteed new and in perfect condition. 100% satisfaction for use in Smith lifetime equipment. #2-4 and #3-4 $1.95 each in quantities of more than 24.
ARC WELDING SUPPLY CO., INC.
467 Bruckner Blvd. Bronx 55, N. Y.

CUTTING MACHINES, AIRCO Camo & Radiagraphs and NATIONAL No. 5.
SEAM WELDER, Progressive, 150 KVA, New.
SPOT WELDER, National, 40 KVA, Used.
CUTTING TORCHES, Used, Oxweld, Airco, Harris.
WELDING TORCHES, New, Rego GV.
BRONZE—STAINLESS—AMPCOTRODES.
ELECTRODE HOLDERS.
RALL SUPPLY CO. 51 E. 42nd St., N.Y.C. 17

EXCEPTIONAL OPPORTUNITY!

Offering for sale at a cheap price first-class round cobalt-blue protective lenses for blast-furnace and steelworks operatives.

6,000 pcs diameter 49 mm
60,000 pcs diameter 50 mm
125,000 pcs diameter 51 mm

Available for single sale at very advantageous terms

Write: Rapid
13 Ulice 28, Rijna, Prague 1,
Czechoslovakia

ad literature

125. Airline Welding & Engineering—Information on how to make fusion butt welding a "push-button" operation.

126. Air Reduction Sales Co.—Complete details on new "56 Oxygraph" for machine gas cutting of larger work on production schedules.

127. Alloy Rods Co.—Complete information on "Atom Arc 7016" iron-powder, low-hydrogen electrodes.

128. All-State Welding Alloys Co., Inc.—Step-by-step guide, "Instruction Manual," for operators who weld, braze, solder, tin and cut without oxygen.

129. American Platinum Works, Inc.—Two complete reference manuals for low-temperature silver brazing and fluxing.

130. Ampco Metal, Inc.—Data on welding dissimilar metals with "Ampco-Trode 10" electrodes.

131. Anti-Borax Compound Co., Inc.—Sample and circular on cast iron No. 1 welding flux.

132. Arcair Co.—Bulletin No. 6-1 contains complete information on new "Model H3" gouging torch that works on all metals.

133. Arcos Corp.—Data on aluminum rods and electrodes for stronger, more ductile and corrosion-resistant welds.

134. Arcos Corp.—Details on stainless electrodes for easily deposited trouble-free metal.

135. Aronson Machine Co.—Detailed engineering data on positioners, turning rolls, turntables and magnetic welding clamps.

136. Aro Spot Welder Div.—Illustrated literature on portable spot welders.

137. Atlas Welding Accessories, Inc.—Details on 30 models of "Tomahawks" for weld cleaning jobs.

138. Ayres Pipe Marker—Details on new small, lightweight pipe marker designed to draw a clean perfect line on any type and size of pipe at any angle.

139. Belden Mfg. Co.—Details on magnet wire and welding cable.

140. Bernard Welding Equipment Co.—Details on "Shortstub" electrode holders for high-current high-speed welding.

141. Burdett Oxygen Co.—"Burdox" catalog on industrial gases and accessories; gas, arc and spot welding; soldering, brazing, safety and cutting equipment.

142. Chicago Eye Shield Co.—Complete catalog on welding helmets and other safety products and name of nearest "Cesco" distributor.

143. Chicago Hardware Foundry Co.—Data on "Fuse-Well" cast-iron welding rods and electrodes.

144. Cincinnati Tool Co.—Catalog showing a clamp for every purpose, also chisels, punches, masonry drills for hand and power hammers, gasket cutters, brace wrenches, file cleaners, etc.

145. Contour Marker Corp.—Information and instruction book on laying out pipe joints.

146. Contour Marker Corp.—Details on establishing and marking a point at any angle.

147. Coyne Cylinder Co.—Specification sheet and price list on acetylene cylinders.

148. Crescent Co., Inc.—Data on "Dynapower" welding cable with positive identification on every foot.

149. Crucible Steel Co. of America—Details on how automatic welding wire gives faster, cleaner, sounder welds, saves you time and money and can help you with your welding problem.

150. Detroit Testing Machine Co.—Catalog sheet and price on portable tensile tester for testing strip steel, wire bolts, spot welds, etc., within its 4,000 lb. capacity.

151. Drawalloy Corp.—Information on precision-drawn hardfacing and welding wire.

152. Electrons, Inc.—Details on electrons for reliability in ignitron firing.

153. Engwald Corp.—Application data on welding-fume exhausters.

154. Eutectic Welding Alloys Corp.—Data on high-speed electrodes for gouging, chamfering and piercing all metals without oxygen. Also details on low-temperature alloys for repairing heavy base castings.

155. Eutectic Welding Alloys Corp.—Details on high-strength, "brazing type" alloy for joining steel and other metals; also alloy for high-tensile strength in repairing; and copper-base, silver-bearing, thin-flow alloy that produces high strength joints on close fitting operations.

156. Eutectic Welding Alloys Corp.—70-page booklet "Welding Data Book."

157. Federal Machine & Welder Co.—Data on three-phase frequency converter spot welder designed for joining tail section of new commercial jet airliner.

158. Fibre-Metal Products Co.—Bulletin No. 53 on "No. 55 Sologoggle" with adjustable elastic headband and "No. F-550 Sologoggle" with headrest for snug or ventilated off-the-face wear with maximum safety.

159. Flood Safety Products Co.—Data on strong, one-piece, non-warping, heat and moisture resistant No. 14 fiber glass No. p. 14 all plastic ratchet-type helmet.

160. Flood Safety Products Co.—Details on face shields, cover lenses and other safety equipment.

162. General Electric Co.—Information on stable arc and current, flexible control and economical operation of rectifier welders.

163. General Electric Co.—Information on how new "Strikeasy 610" iron-powder E-6010 electrode produces better welds in all positions.

164. Goldsmith Bros. Smelting & Refining Co.—"GB Data Book" gives complete information on low-temperature silver-brazing.

165. Harnischfeger Corp.—Bulletin R-29, "P&H Smootharc Welding Electrodes," gives full description and specification data on high speed iron-powder electrodes.

166. Harnischfeger Corp.—Send for "Load Capacity Data Sheet No. 2" to help you select the positioner best suited to your needs.

167. Harrisburg Steel Co.—Send for literature and prices, on gas cylinders, specifying with or without caps and valves.

168. Harris Calorific Co.—Details on the "K-23 Super Heating-Torch" for either propane, city or natural gas in combination with oxygen.

169. Harris Calorific Co.—Information on torches for natural gas and propane, with compressed air.

(Continued on page 108)

AD INDEX

Airline Welding & Engineering 100
Air Reduction Sales Co. 44-45
Allen Co., Inc., L. B. 104
Alloy Rods Company 83
All-State Welding Alloys Co., Inc. 94
American Chain & Cable Co., Page Steel & Wire Div. 40-41
American Platinum Works, Inc. 14
Ampco Metal, Inc. 52
Anti-Borax Compound Co., Inc. 102
Arcair Company 98
Arcos Corporation 80, 81
Aronson Machine Co. 76
Aro Spot Welder Div., Guthery Machine Tool Corp. 92
Atlas Welding Accessories, Inc. 10
Ayres Pipe Marker 95

Belden Mfg. Co. ..... Inside Front Cover
Bernard Welding Equipment Co. 11
Burdett Oxygen Co. 61

Chicago Eye Shield Co. 2
Chicago Hardware Foundry Co. 103
Cincinnati Tool Co. 101
Contour Marker Corp. 96, 99
Coyne Cylinder Co. 94
Crescent Co., Inc., Carol Cable Div. 51
Crucible Steel Co. of America 47

Detroit Testing Machine Co. 97
Drawalloy Corporation 93

Electrons, Incorporated 68
Engwald Corporation 102
Eutectic Welding Alloys Corp. 79

Federal Machine & Welder Co. 71
Fibre-Metal Products Co. 12
Flood Safety Products Co. 101

General Electric Co. 54-55, 56
Goldsmith Bros. Smelting & Refining Co. 90
Guthery Machine Tool Corp. Aro Spot Welder Div. 92

Harnischfeger Corp. 69, 85
Harrisburg Steel Co. 86
Harris Calorific Co. 63
Haynes Stellite Co., Div. of Union Carbide & Carbon Corp. 73
Hobart Bros. Co. 1

Independent Engineering Co., Inc. 99
International Nickel Co., Inc. 75

Jackson Products Div., Air Reduction Sales Co. 4

K-G Equipment Co., Inc. 89
Kedman Company 103

Lenco, Inc. 96
Lepel High Frequency Labs, Inc. 102
Lincoln Electric Co. 16
Linde Air Products Co., Div. of Union Carbide & Carbon Corp. 8, 43
Lovell Chemical Co. 103

Manhattan Rubber Div., Raybestos-Manhattan, Inc. 39
Merrill Brothers 78
Metal & Thermit Corp. 91
Metallizing Engineering Co., Inc. 84
Miller Electric Mfg. Co., Inc. ..... Front Cover, 87
Mitchell Radiation Products Corp. 72

National Carbide Co. 98
National Welding Equipment Co. 7
Norris-Thermador Corp. 35

Page Steel & Wire Div., American Chain & Cable Co. 40-41

Rankin Manufacturing Co. 88
Raybestos-Manhattan, Inc., Manhattan Rubber Div. 39

Smith Corp., A. O. ..... 36-37, Back Cover
Smith Welding Equipment Corp. 53
Square D Company 15
Stulz-Sickles Co. 101
Superior Air Products Co. 92
Sylvania Electric Products, Inc. ..... Inside Back Cover

Taylor-Winfield Corp. 82
Tec Torch Co., Inc. 103
Tempil Corporation 100
Tillman & Co., John 102
Tube Turns, Inc. 49-50
Tweco Products, Inc. 66

Union Carbide & Carbon Corp., Haynes Stellite Co. 73
Union Carbide & Carbon Corp., Linde Air Products Co. 8, 43

Vickers Electric Div., Vickers, Inc. 58
Victor Equipment Co. 18

Welding Engineer Publications, Inc. 64-65

York Engineering Co. 97

WELDING INFO-AIDS

USE THIS CARD for Literature, Catalogs, and Bulletins shown on preceding pages and for those featured in this month's ads as listed opposite and on following page.

Also information about

NEW PRODUCTS described on pages 78 to 86

Every month WELDING ENGINEER lists many new catalogs and bulletins available from manufacturers. All are yours for the asking. However, this service is valuable to you only if you use it.

USE POSTPAID CARD →

★ For copies of any manufacturers' bulletins described on these pages, circle the number of the items on card at right. Fill in your name, title, company and address. This has to be done only once on either post card. You need no postage.

★ For additional information on New Products described in this issue, circle the numbers and the items that interest you. The New Products section begins on page 78.

WARNING!

Illegible or incomplete addresses may keep you from receiving the information you desire. And remember, cards, postmarked after the deadline date cannot be processed.

★ Post card not valid after three (3) months. After that time has elapsed, use your own letterhead to describe fully the information and/or literature wanted.

Name_____ Title_____

Company_____

Address_____

City_____ State_____ 1/57

NOT GOOD AFTER APRIL 1, 1957

WELDING ENGINEER, 12 East Grand Ave., Chicago 11, Ill.

Please send me without obligation further information about the following:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD
First Class Permit No. 45854, Chicago, Ill.

Welding Info-Aids,
Welding Engineer
12 East Grand Avenue
Chicago 11, Ill.

ad literature

(Continued from page 106)

170. Haynes Stellite Co.—Information on complete line of tube rods in coils and 19 hardfacing alloys.

171. Hobart Bros. Co.—Information on a-c/d-c combination, electric motor drive, gas engine drive welders, and specifications and prices on d-c rectifier arc welders.

172. Hobart Bros. Co.—Details on d-c power/a-c welder combination, "Husky Boy" air cooled and a-c transformer welders.

173. Hobart Bros. Co.—Data on automatic arc welding, semiautomatic welding and iron-powder electrodes.

174. Independent Engineering Co., Inc. Details on how to reduce cylinder handling with gas supply trailers.

175. International Nickel Co., Inc.—"A Handy Guide to Welding Cast Irons," gives tips on preparation, welding techniques and getting maximum machinability out of "Ni-Rod '55' " electrodes.

176. Jackson Products Div.—Details on interchangeable lens holders, headgears, arc welding helmets and electrode holders, ground clamps and cable fittings.

177. K-G Equipment Co., Inc.—Details on how you can save money with the "Series 1200" single-stage regulator.

178. Kedman Co.—Information on welding helmets, face shields and accessories.

179. Lenco, Inc.—Details on "Hi-Amp" electrode holders.

180. Lepel High Frequency Laboratories, Inc.—Catalog contains information on high-frequency induction heating units for brazing, annealing, hardening, soldering and melting.

181. Lincoln Electric Co.—Bulletin SB-1364 on "Idealarc" 250-amp a-c/d-c arc welder combination.

182. Linde Air Products Co.—Details on "Heliarc" welding apparatus.

183. Linde Air Products Co.—Details on "Purox W-200" welding blowpipe.

184. Lovell Chemical Co.—Details on "No-Short" abrasion-resisting dielectric coating that prevents "shorts" and protects electrodes, horns, holders, seam welding sheets and arms.

185. Manhattan Rubber Div.—Information on cut-off wheels for safe, fast and clean cutting to improve quality.

186. Merrill Bros.—Information on lifting clamp, twin and drum lifters, drum tilter and other material handling devices.

187. Metal & Thermit Corp.—Information on how "Speedex-R" electrodes may be applied to your specific problem.

188. Metallizing Engineering Co., Inc.—Bulletin 126 on hardfacing.

189. Metallizing Engineering Co., Inc.—Bulletin 127 on ceramic coatings.

190. Miller Electric Mfg. Co., Inc.—Data on "SR" selenium-rectifier, d-c arc welders.

191. Miller Electric Mfg. Co., Inc.—Details on "SRH low-boy" d-c rectifier welder.

192. Mitchell Radiation Products Corp.—Details on portable industrial X-ray equipment.

193. National Carbide Co.—Write for name and address of nearest supplier.

194. National Welding Equipment Co.—Data on cutting torch with "Multiple Mixing" mixer that can be located within the torch handle, torch tubes or torch head.

195. Norris-Thermador Corp.—Specifications, sizes and prices of acetylene cylinders.

196. Page Steel & Wire Div.—Folder DH-1277 on gas welding rods.

197. Page Steel & Wire Div.—Folder DH-402A on submerged-arc and inert-gas welding wire.

198. Rankin Mfg. Co.—Further details on hardfacing electrodes and rods.

199. Smith Corp., A. O.—Details on how the "Semi-Universal E-6012" electrode for difficult welds on motor grader was developed.

200. Smith Corp., A. O.—Details and Bulletin MW-185 on arc welders.

201. Smith Welding Equipment Corp.—Information on "Silver Star" cutting torch for fast cutting at low pressures.

202. Square D Co.—Information on how magnetic or electronic welder control can best fit your applications.

203. Stulz-Sickles Co.—Complete details on "Manganal Flo-Kote" manganese-nickel steel a-c and d-c welding electrodes.

215. Superior Air Products Co.—Catalog describes single and double rectification plants and lists production data, shows flow charts and plant layouts.

204. Sylvania Electric Products, Inc.—Information on color-coded tungsten electrodes.

205. Taylor-Winfield Corp.—Details on how custom-built projection welder can assemble 15 different products that are similar, reducing assembly costs.

206. Tee Torch Co., Inc.—Leaflet on transparent gas cups for Tig torches.

207. Tempil Corp.—Information on "Tempilstik" and "Tempilaq" temperature indicators.

208. Tempil Corp.—Sample pellets and booklet, "How Temperatures are Measured."

209. Tillman & Co., John—Catalog on weldors' gloves and garments.

210. Tube Turns, Inc.—Bulletin on "Taper Face Flanges."

211. Tweco Products, Inc.—Catalog on complete line of arc-welding accessories and "Tweco-Lite" aluminum arc welding cable.

212. Vickers Electric Div.—Information on "Controlarc" d-c welder that gives you remote control of current and type of arc.

213. Victor Equipment Co.—Details on torch for hot, tough jobs that lasts longer.

214. York Engineering Co.—Details on how "Spat-R-Pruf Compound 106" eliminates grinding after welding.

Postage Will Be Paid by Addressee

No Postage Stamp Necessary If Mailed in the United States

BUSINESS REPLY CARD

First Class Permit No. 45854, Chicago, Ill.

Welding Info-Aids,

Welding Engineer

12 East Grand Avenue

Chicago 11, Ill.

Name_____ Title_____

Company_____

Address_____

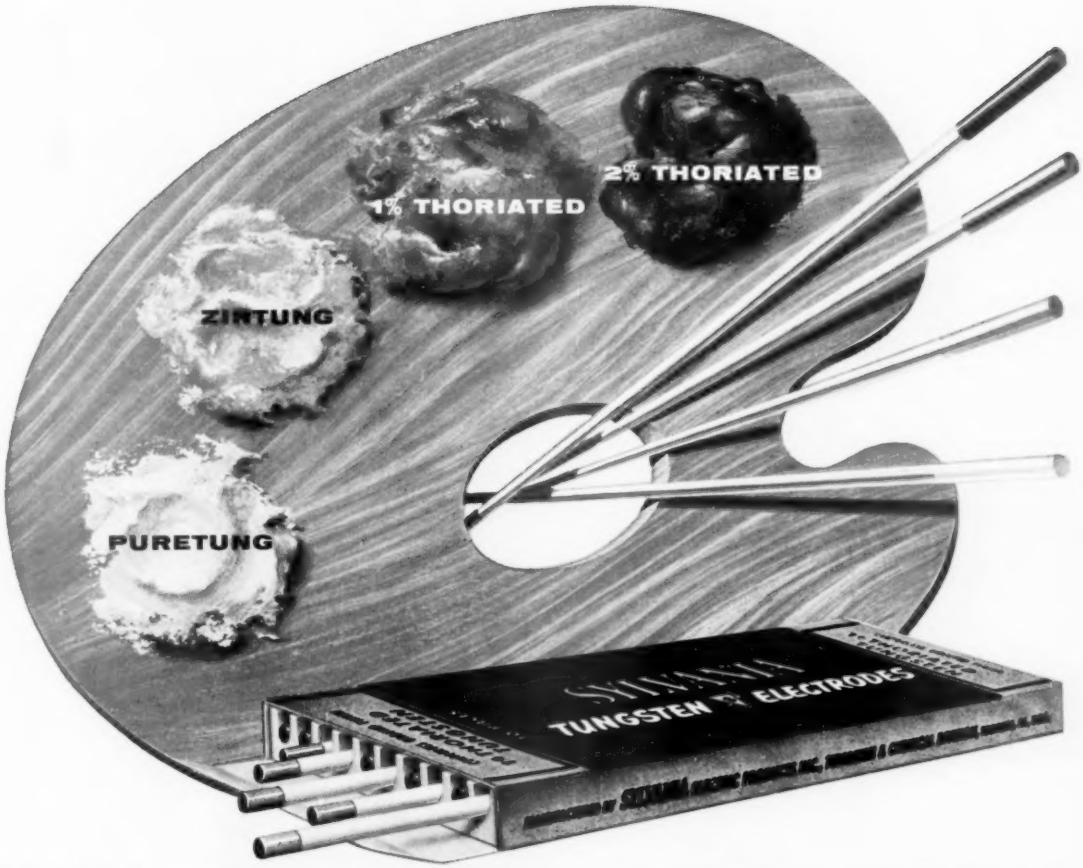
City_____ State_____ 1/57

NOT GOOD AFTER APRIL 1, 1957

WELDING ENGINEER, 12 East Grand Ave., Chicago 11, Ill.

Please send me without obligation further information about the following:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75
76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125
126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175
176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225
226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250



NOW—color coded for your convenience!

SYLVANIA TUNGSTEN ELECTRODES

Now all Sylvania Tungsten Electrodes are color coded . . . for greater safety . . . greater economy and convenience. You can tell the type of rod merely by glancing at the exposed end.

Used lengths of rods, regardless of size, no longer need to be scrapped for lack of identification. And no longer do you risk ruining a costly job because of choosing the wrong electrode. When you use Sylvania color coded electrodes, you know for certain which rod type you have in your clamp.

Color coding is just one of the many advantages that make Sylvania Tungsten Electrodes your best buy. Only Sylvania has the *complete* line—four types of electrodes, each designed for a specific job in shielded arc welding. Whether you use argon, helium, or atomic hydrogen, the four dependable electrodes will effectively meet almost any condition you may encounter.

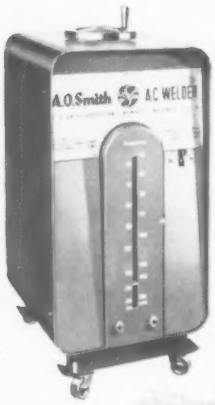
Supplied with chemically cleaned or centerless ground finish, Sylvania Tungsten Electrodes are available in handy packages of ten color coded rods. For further information see your welding supplies distributor or write to:

SYLVANIA ELECTRIC PRODUCTS INC.
Tungsten and Chemical Division, Towanda, Pa.

TUNGSTEN • MOLYBDENUM • CHEMICALS • PHOSPHORS • SEMICONDUCTORS

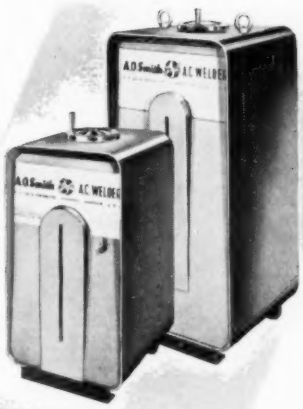
SYLVANIA

Lighting • Radio • Electronics • Television • Atomic Energy



Model 20-S

NEW LINE of low-cost A. C. welders gives you the model...



CHALLENGER Models

"Right on the button!"

for power, for utility, for price

Top Left

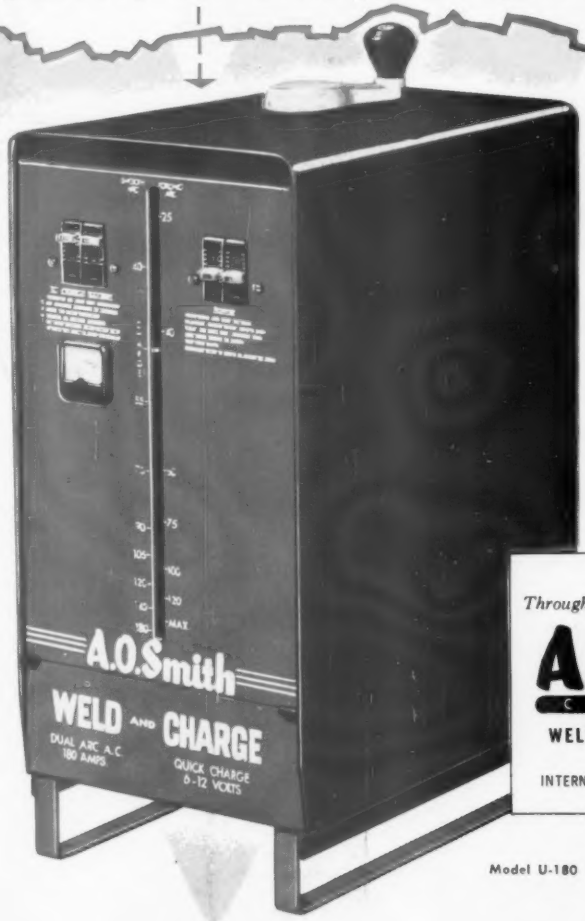
Model 20-S 200 amp low-cost shop welder is specifically designed for maintenance and repair of equipment or for light fabrication. Meets all NEMA standards.

Top Right

CHALLENGER Models of 200, 300 and 400 amps. Designed for all-purpose production welding at moderate cost. Each handles wide range of electrode diameters. Features include: stepless current control, high velocity ventilation, precision wound coils and all-weather case.

Right

Model U-180 is a combination 180-ampere a-c welder and full 6 or 12-volt battery charger. Easily portable, it features dual welding ranges for light or heavy gauges. Meets all safety requirements.



Model U-180

For details

on these and other welders in the complete A. O. Smith line (9 standard a-c models, 8 standard d-c models) — ask for Bulletin MW-185.

Through research ... a better way

A.O.Smith

CORPORATION

WELDING PRODUCTS DIVISION

Milwaukee 1, Wisconsin

INTERNATIONAL DIVISION: Milwaukee 1, Wis.